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THE WELDING ENGINEER

OCTOBER, 1949

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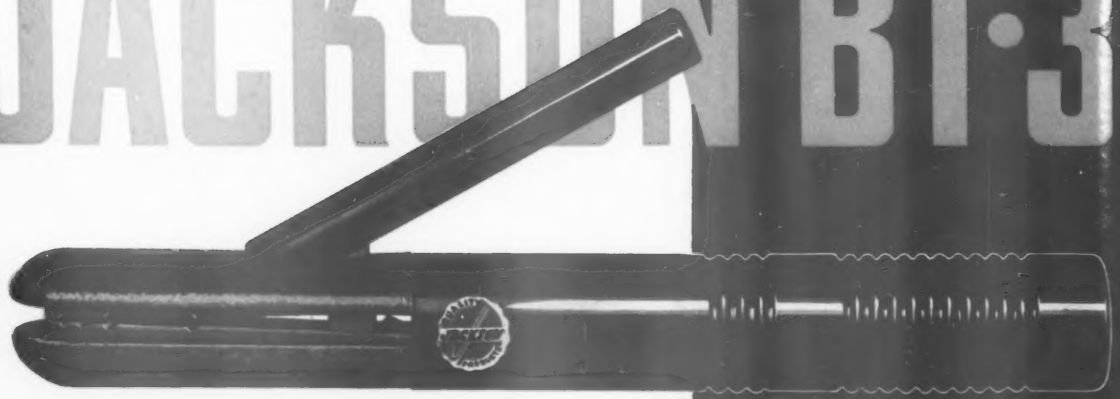
AWS CONVENTION AND METAL SHOW NUMBER

A McGRAW-HILL PUBLICATION

JACKSON BT-3



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Here is good news to those weldors who prefer blade type arc welding electrode holders.

Check its many features and give it a try. You will agree that here's a holder that is *economical*, *safe* and *cool working*.

- It consists of a minimum of parts, all easy to replace and at low cost.
- Metal parts are more completely insulated. Crown-type jaw insulators of laminated fiberglass with melamine binder and other high heat resistant material, are stronger than ever.
- Tested during a continuous duty cycle at 300 amps and using ten ¼ electrodes, the temperature rose only to a comfortable 130° F. (pyrometer tested) on the handle.

CHECK THESE FEATURES

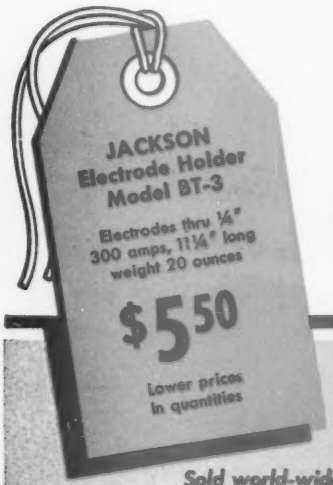
JAWS: ¾-inch wide blade type jaws hold electrodes in their own springsteel grip. Unique groove arrangement permits rods to be used at four different angles, in either the right or the left hand.

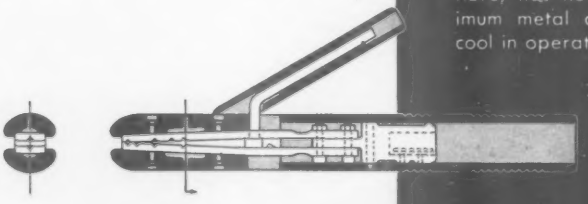
JAW INSULATORS: Made in the Jackson-originated channel and crown type design (patented), they give more protection and deflect the arc heat. Made of a new material which increases many times the impact, flexural and compression strength of Jackson insulators. Upper and lower insulators are interchangeable, for even longer work life.

LEVER provides smooth and immediate rod changes, has complete, one-piece insulation.

CABLE CONNECTOR of copper alloy makes flat, metal-to-metal contact full width of both blades. Cables may be brazed, soldered, or clamped in place.

HANDLE, of finest quality hard-boned fibre, has heavy wall thickness—minimum metal contact—is exceptionally cool in operation.





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THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

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AO Safety Clothing keeps out of the Worker's Way!

Whether it's a coat, overall, mitten, glove or spat . . . when you order safety clothing from AO you obtain maximum comfort and serviceability as well as protection. The AO welders' clothing illustrated of chrome-tanned cowhide is typical. Your nearest AO Safety Products Representative can supply you.

208BCL CAPE SLEEVE WITH DETACHABLE BIB

Does a 3-way protection job on arms, chest and shoulders. Typical AO thoroughness is shown by the double cotton stitching and steel sewing of all seams. Seam ends reinforced with rivets. Bib attached to front of cape with steel fasteners. Anchor button at each armpit keeps cape securely buttoned. Standard sizes are double extra large, large, medium and small.

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An AO spat that has proved itself invaluable on the job time after time. Protects instep and ankle. Easily adjusted at top and under instep by snap fasteners. Releases immediately in one speedy motion. Chrome leather flare over instep.

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ESTABLISHED 1916 THE WELDING ENGINEER OCTOBER, 1949

American Industry—An Epic

HIGHLIGHTING the gloomy pages of history are brief passages when some happy combination of circumstances has enabled a relatively small part of the human race to throw off its shackles and demonstrate, if only for an instant, of what the free human spirit is capable. Such a period of glorious accomplishment occurred in Athens under Pericles, England under Elizabeth. And such from 1775 on has been our own United States.

A book like *The Epic of American Industry** makes one realize that America became great primarily because its industry was free. When we were merely a group of weak, loosely connected colonies, England and other great powers of the eighteenth century were fostering government monopolies. "Taxation without representation" we called it here. After reading this volume, you may wonder whether the revolution was fought to free people or to free trade.

The colonial revolutionaries of 1775 were preeminently business men. The economy of the times was built on foreign commerce. Foreign trade got under way as early as 1621, when the Plymouth Colony during its first year in the new land shipped two hogsheads of beaver pelts to England.

Shipbuilding and salt cod soon became the most important industries of New England, while Virginia planters grew rich on tobacco. Next, the ships of the New World were carrying rum, sugar and slaves in the famous three-cornered trade. Then came trouble. The Lords of London decreed that all trade must be through England. Instead of being free to trade where and with whom they pleased, the colonists must pay tribute to the crown for their ingenuity and enterprise.

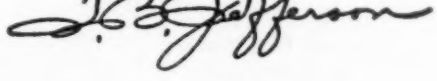
The idea sounds suspiciously like "statism," and it smelt no better then than the philosophy of Karl Marx does today. Regardless of the reason for the Revolution, political freedom was won along with freedom for trade. So today we enjoy both political freedom and abundance of the world's goods—two precious rarities in a world full of repression, famine and strife. The attainment of these twin blessings is the story, so aptly told in Walker's volume, of American business and civilization.

It is the story of the trapper, the trader, the merchant, the farmer, the entrepreneur and the manufacturer as they combined forces to make a new system of economics work. The doors of opportunity were flung wide open, and each man could be his own master if he had the wit and the daring.

Because men were able to profit from their labors, there was in America an active incentive to exert human energy for the benefit of all. Natural resources which were a part of the country when it was the land of the mound builders were tapped and converted for human good.

The unbounded energy of a free people brought an industrial growth which, in the short span of 170 years, made a more comfortable life for the common man of today than kings had ever known back in the "good old days." In but three generations, industry and industrious workers have taken us from candles and oil lamps to gas jets and then electric bulbs, neon lights and fluorescent tubes; from an ox cart to an airplane. The same short span from grandfather to grandson has given us an entirely new metal-fabricating process—welding.

Twice in the last generation destiny has called upon American industry to turn back the military hordes of aggressor nations. The story of free men working in unfettered industry is truly the epic of America—may it long continue!



*By James Blaine Walker. Published by Harper & Brothers, New York, 1949. Cloth, 6 x 9 in., 513 pages; price $5.

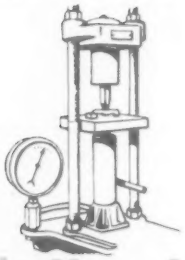
They'll break—

Sure they'll crack and break if you *can* hit them hard and often enough, or drop them from some dizzy height. After all they are not indestructible. They can't be. Nothing is.

They'll disintegrate—

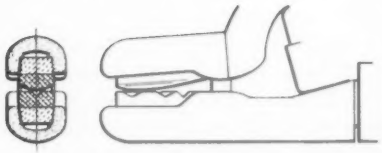
Sure they'll eventually burn away—if you *can* heat them continuously to enough thousands of degrees Fahrenheit. Is there anything under the sun that won't?

—Just the same . . .



Through continuous experiment and endless testing, we have developed new jaw insulators for Jackson Electrode Holders. Made of laminated fiberglass with melamine binder and other high heat resistant material, these insulators more than keep step with "Economy in Production". They are built to take the higher amperages, larger electrodes and greater duty cycles, increasingly called for in arc welding operations.

Jackson's New Jaw Insulators are 5 times Stronger!



Now, the Jackson originated channel and crown type design is stronger in every way. Developed and produced in Jackson's Plastic Division, these new insulators are now furnished *standard* on all Jackson Insulated Holders. Regardless of their greatly improved quality, we are glad to say . . .

Yet . . . they cost you no more

Decked out in its brand new jaw insulators, the Jackson arc welding electrode holder, Model A-W, is shown above. Most popular in the line of Jackson Holders, it is "Featherlight" (14 oz.), handles electrodes including ¼ inch at 300 amperes.

It still sells at the same price . . $6.00 (lower prices in quantities).

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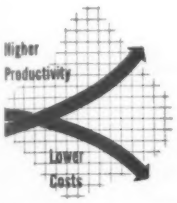
Tools for Welding

No craftsman can do better work than his tools allow. The tools for welding are many and varied. Some are universal and some apply only to one process. A few of each are discussed in this special section

BY T. B. JEFFERSON



EVERY TRADE or craft (of which welding is one) must have its tools. Welding—America's best means for reaching the goal of higher productivity and lower cost—requires many tools and accessories.

The space limitations make it impossible to discuss all of the tools for welding in any single issue of THE WELDING ENGINEER. Our front cover shows some of them, and more are illustrated on the following pages. We are presenting this special section because we believe that a description of the tools to use is vital to all who work at or with welding. Many weldors are not thoroughly familiar with the function or purpose of all of these tools. Without such an understanding, it is impossible to obtain the most efficient and most satisfactory use.

The descriptions which follow may seem elementary to some, but they are designed to:

1. Describe the purpose of the product.
2. Point out sought-for results.
3. Give leads as to how these results may be obtained.
4. Pass on hints on operation for longer life.

Welding employs hundreds of tools, only a few of which can be included in the presentation on the following pages. Those covered in the current selection are not necessarily the most important as far as welding is concerned. The importance of a tool can best be judged by the job to be done. Sometimes a tip-cleaning drill is much more important than the most elaborate flame-cutting machine—without clean tips a good job of flame-cutting is impossible. A similar case may be made for other types of tools.

Some of the tools required for welding vary with the kind of welding, but others are required regardless of the welding being undertaken. Cleaning and finishing tools are examples of those universally required. We will look at some of these on the following pages: scaling and chipping hammers, brushes of the hand and rotary types, grinding wheels of many different descriptions. Jigging, holding and positioning tools are also used regardless of the welding process involved.

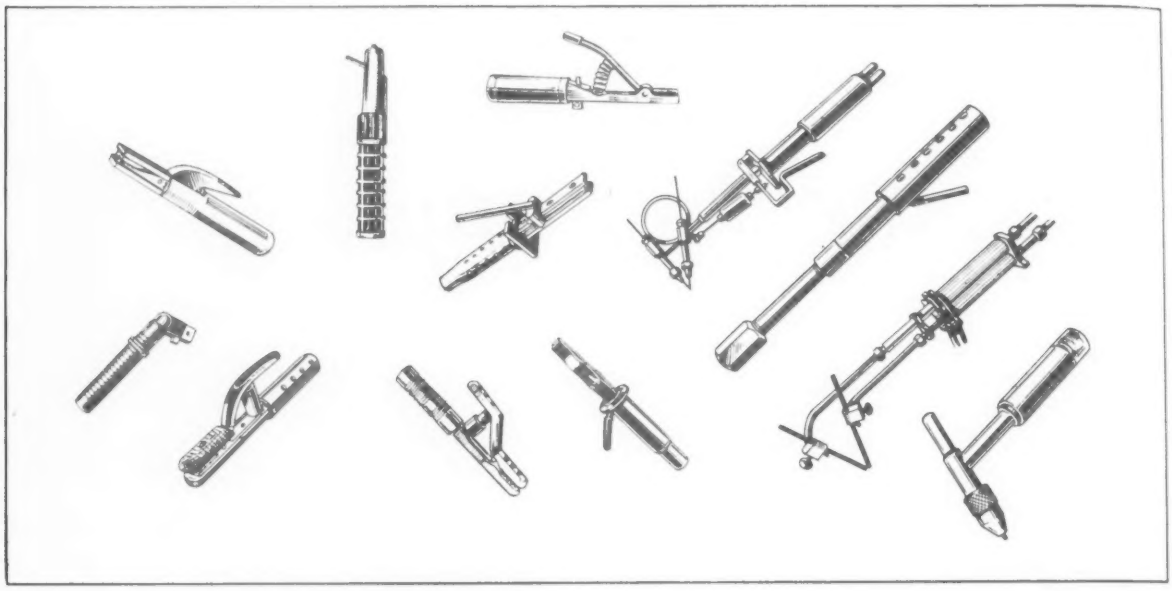
Examples of the tools required only for a specific welding process will be found in electrode holders, ground clamps, cable connectors and cables—all used exclusively in arc-welding applications. On the other hand, gas-welding and flame-cutting applications require hoses, torches, torch tips and spark lighters. It is difficult to draw a line, however, for there are many jobs of arc welding which simply can't be done without the supplementary aid of a flame-cutting torch. In this sense, it might be said that all of the tools required for flame-cutting are also tools for arc welding.

Resistance welding resembles arc welding in that it necessitates a specific machine before the process may be undertaken. In addition, it requires accessories such as resistance-welding electrodes and electrode holders, cables, guns and often elaborate fixtures—all tools peculiar to resistance welding.

We mentioned earlier that cleaning and finishing tools are universally used in all welding processes. The same applies to protective clothing and safety devices. Rarely will you see a safe worker in any kind of welding operation without eye protection. It may take the form of a helmet with a highly light-resistant lens in the case of an arc weldor, goggles with light-resisting lenses for a gas weldor or a plastic face shield for the man in front of the resistance-welding machine. The character of the outer clothing to be worn will be determined by the amount of heat involved.

Positioning equipment is an extremely important tool in production welding applications. The same may be said of jigs, fixtures and other holding devices. In this presentation, however, only the more simple clamps are discussed. More complicated fixtures and positioning units will be reserved for a subsequent article.

Remember that the weldor can do no better job than is capable of the tools with which he has to work. It is well to measure each tool for welding with the working standard under which it is to be subjected. A tool that meets this standard may be slightly more costly yet will often prove to be the most economical in the long run. A tool that gives economy of operation coupled with long life will make it easier to attain our desired goal of higher productivity at lower cost.



Electrode Holders

WHEREVER ARC WELDING is undertaken, there is sure to be an electrode holder in the middle of the picture. Electrode holders may vary in size, appearance and style, but each is designed to hold something—either a metal, carbon or tungsten electrode.

The metal-arc electrode holder is in reality a multipurpose tool. Besides holding the electrode securely during welding, it must also be so constructed as to provide an easy means of removing the burned stub and inserting a fresh electrode. This immediately presents the problem of good electrical contact, for the point at which the electrode is gripped should provide as good an electrical contact as is provided at the holder cable connection. Usually, the cable is connected to a copper lug within the handle by a mechanical or soldered joint.

There are many requirements for an electrode holder in addition to giving the weldor a convenient means for holding and guiding the electrode. An important point is that the welding current must be conducted from the cable connection to the electrode with a minimum of resistance; otherwise there will be heat, which might make the electrode holder too hot for comfortable use.

An insulated handle will, of course, reduce the heat effect. On some holders, the entire holder is insulated to reduce the possibilities of electrical shock during welding.

The electrical contact between the metal-arc electrode and electrode holder is obtained in one of several ways. The more common method is to grip the electrode between two jaws by means of pressure exerted by a powerful spring. In another jaw-type holder, the gripping pressure is provided by a screw and cam action. A third type of holder eliminates jaws by having the electrode inserted in a hole, where it is held in place by screw action to insure good electrical contact.

Keep the holder clean to insure its maximum life! Clean jaws and contact points mean a good electrical connection and consequently less heating and burning of the holder. The insulation of an insulated holder must be kept in good repair and tight. Where the jaws are closed by a spring, inspection should be made to see that the spring is in good order at all times. When working under extreme heat, springs sometimes lose their temper and must be replaced. A weak spring not only slows up welding but reduces the quality of the weld.

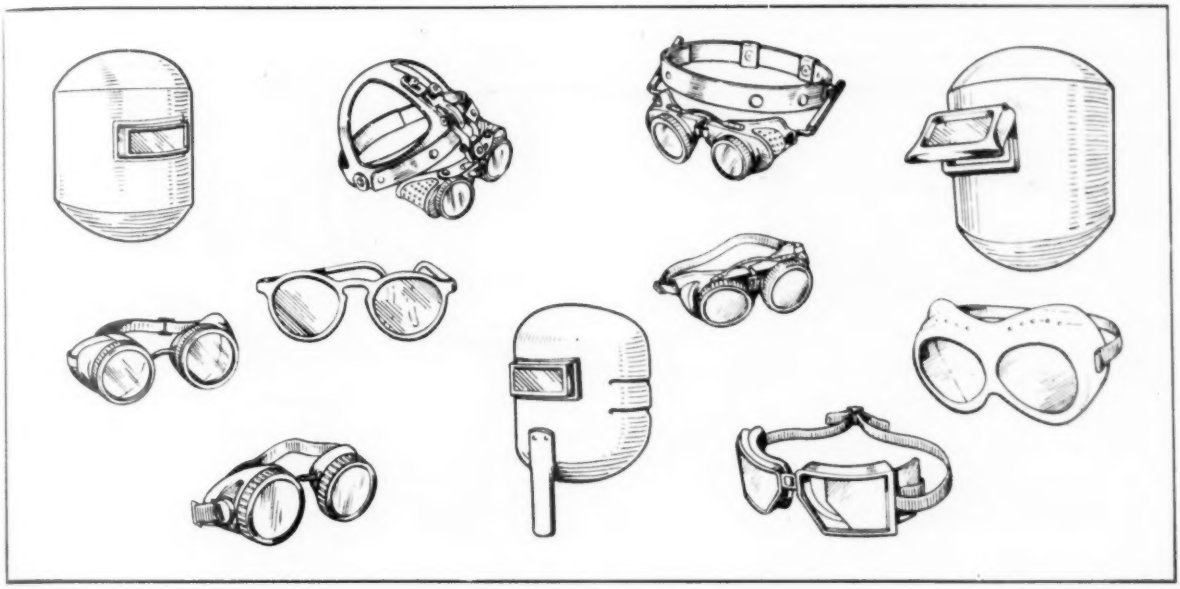
In addition to the several types of metal-arc holders just described, the sketches also show holders for atomic-hydrogen welding, carbon-arc welding, twin-carbon arc welding and inert-gas-shielded arc welding. All of these holders are distinctive in character and designed to do a specific job. They can be readily identified from the sketches.

Atomic-hydrogen and inert-arc holders handle tungsten electrodes. Two electrodes are needed for atomic-hydrogen welding and one for the inert-arc process. These electrodes are gripped in a collet chuck. Both types of holders are provided with a gas-conducting case around the electrode to provide a gas shield for the arc during welding.

The single-carbon holder is designed to hold a carbon electrode in much the same manner as a metal-arc holder. Carbons range from 3/16 to 1 in. in diameter. This type of arc is used for either high-temperature welding or cutting operations.

The twin-carbon holder is an "arc torch" that holds two carbons in such a manner as to complete the electrical circuit between them. It is thus somewhat similar to the atomic-hydrogen holder. A soft "flame" which simulates a torch flame is produced with the two-carbon electrode arrangement.

No matter what the type of holder, there is never any excuse to throw it around. Nor will an electrode holder ever substitute satisfactorily for a hammer. Proper care and commonsense treatment will make electrode holders last longer, as is the case with all tools.



Helmets and Goggles

PROTECTION about the face and eyes is afforded by helmets with protective lenses or by goggles, depending upon the type of welding operation being undertaken. The intensity of ultra-violet and infra-red radiation is greater for arc welding than for gas welding operations. For this reason, the welding operator engaged in arc welding wears a helmet.

Helmets for weldors are made of fibre and fish paper, in various types and styles. As a matter of economy and safety, the welding helmet should be of good quality. For overhead welding, it should be provided with a lift-front lens holder.

The protective or tinted lens of the helmet should be guarded by a clear cover glass, which may be either a thin glass or a sheet of celluloid. Usually, two cover glasses are placed in front of the protective lens and one behind it. In this manner, the expensive lens is protected from dust as well as weld spatter. A gasket should be placed in front of the cover glass to prevent light rays and sparks from leaking through.

The weldor should wear a cap under his helmet to protect his head from flying spatter, which might burn his hair and scalp. The cap under the helmet also makes a cushion for the headband and hence helps to reduce eyestrain.

The life of a helmet depends upon its care and treatment. A misshapen helmet may be reshaped by placing it in hot water for a few minutes and then putting it on the operator's head to restore its original shape. To insure healthful working conditions, it is well to sterilize the helmet or goggles occasionally.

An arc weldor is frequently required to wear clear goggles under his helmet to prevent slag and other particles from flying into his eyes during cleaning operations. These may be either spectacle or band-type goggles.

Welding goggles range in design from the spectacle to the headrest type. The protective lenses should be protected by cover glass, as in helmets.

The protective lens for a helmet or goggles may be selected in various shades of two different colors: amber and green. The weldor may pick the color he deems best for his eyesight, but he should not be allowed to select the shade. There is a vast difference in welding lenses, both as to protective value and as to effect on welding production. When selecting a welding lens, it is vitally important to take into account the reputation of the manufacturer and his experience in the welding field.

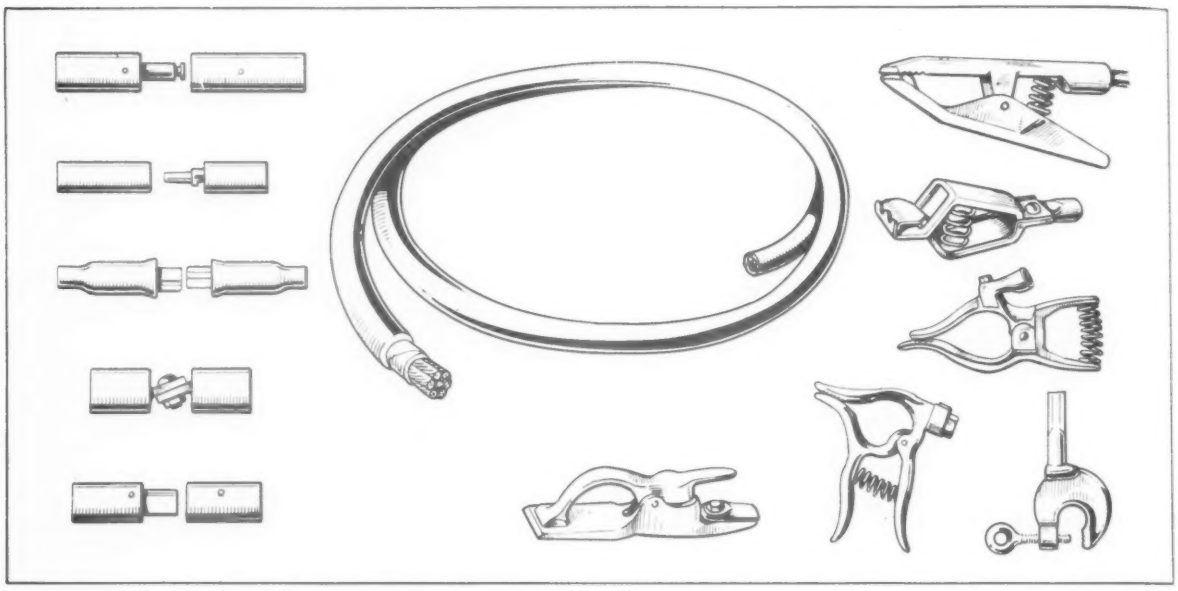
The National Bureau of Standards has set up specifications for allowable minimum and maximum percentages for transmitted light within the visible range of the spectrum and limitations on transmission of infra-red and ultra-violet radiation. Because of these standards, when a weldor wishes to re-order a lens he simply specifies the lens shade number and may rest assured that he will obtain a lens identical in every way with the old one. Table I shows the various shades of lenses to be used in connection with the different types of welding and cutting.

Table I. Lens Shade Recommendations

	Lens Shade No.
Light welding or lead welding	4
Spot welding, min	5
Flame-cutting, min	5
Gas welding	5 or 6
Gas cutting	6
Arc welding to 30 amp	6
Heavy gas welding	8
Arc welding and cutting to 75 amp	8
Arc welding and cutting 75 to 200 amp	10
Arc welding and cutting 200 to 400 amp	12
Arc welding and cutting over 400 amp	14

There is now available a protective lens which, in addition to being tinted, has a silver coating on one side. This coating reflects infra-red and ultra-violet rays, and the lens is claimed by the manufacturer to afford greater protection to the weldor because of this quality.

For safe welding and cutting, remember that the lenses of helmets and goggles must always be clean.



Welding Cables, Connectors and Ground Clamps

TWO CABLES—an electrode and a ground cable—are required to complete the electrical circuit between the welder and the work. These are among the most important influences in the whole welding operation on the quality of the work. In particular, the size and quality of the cable used to connect the machine with the electrode holder is extremely important. Too small a cable for the amount of current carried will waste energy in heat, which causes the cable to deteriorate rapidly.

A rubber-covered, multiple-strand copper cable specially developed for welding service generally gives the best results from the standpoints of efficiency and durability. The greater the number of strands of wire in a welding cable, the greater its flexibility. Table I gives information as to the stranding and diameter of welding cables. The third column of this table will probably require an explanation. The first one or two figures represent the number of bundles, the next figure the number of wires to a bundle and the final figure the diameter of the wire in inches. Thus 7/150/0.0050″ is a convenient shorthand method of saying that there are seven bundles of 150 wires each, the diameter of the wire being 0.0050 in. or 36 gauge. Slightly more complex is such an indication as 7/7/109/0.0063″. This may be interpreted as seven bundles *of* seven bundles of 109 wires of 0.0063-in. diameter (34 gauge).

The high flexibility of a welding cable is derived from its method of construction. It may be woven with thousands of fine, almost hairline strands of copper enclosed in a durable wrapping (usually paper) which allows the strands to slip readily within the rubber insulation when the cable is bent. The insulation should be able to withstand high voltages without breakdown, and the jacket should be tough, flexible and resistant to abrasion and heat. The best grades of welding cable have an extra-tough braided-cotton reinforcing and a waterproof rubber covering of special composition and curing. The rubber coating provides the cable with a smooth finish that is highly resistant to abrasion.

When a long lead cable is used, it may be entirely of the flexible type, or there may be merely ten feet or so of flexible cable spliced to the electrode-holder end of a less flexible cable. A highly flexible cable is more convenient and results in better welding because of lessened operator fatigue.

In arc welding, the work forms part of the electrical circuit. Hence it is essential that an adequate size of cable be utilized on the ground side of the welding circuit. The ground cable should be of the same size as the electrode cable, but it does not need to be as flexible since it lies for most of the time in one spot.

Try to use as short a cable as possible. If the distance from the machine is too great, the voltage drop becomes so large as to affect the amount of electrical energy transmitted to the welding arc. Naturally, this will also affect the quality of the welds that are being produced. If the work has to be located at a considerable distance from the welding machine, it is important that the connecting cable be larger in diameter than when the distance is short. The cable size is thus a function of distance as well as amperage. Table II gives recommended cable sizes for distances varying up to 400 ft from the welder (distance=total length of electrode and ground cables divided by two) and currents of from 100 to 600 amp. Where no cable size is given, the transmission of welding current is not recommended for the specified distance and amperage.

Every welding circuit has at least four cable connections and possibly more. They are extremely important. If a cable connection is inadequate,

Table I. Arc-Welding Cable Data

AWG size	Number of strands	Stranding	Diameter of Bare Conductor, in.	OD of covered Cable, in.
6	1,050	7/150/0.0050"*	0.21	0.400
4	1,050	7/3/ 50/0.0063"†	0.28	0.495
3	1,344	7/3/ 64/0.0063"	0.31	0.510
2	1,680	7/3/ 80/0.0063"	0.38	0.560
1	2,142	7/3/102/0.0063"	0.40	0.625
1/0	2,695	7/7/ 55/0.0063"	0.44	0.675
2/0	3,381	7/7/ 69/0.0063"	0.49	0.750
3/0	4,284	7/7/ 87/0.0063"	0.54	0.815
4/0	5,341	7/7/109/0.0063"	0.63	0.900

* 36 gauge. † 34 gauge.

Table II. AWG Cable Size Selection Guide

Current, amp	Distance from welder (Total length of electrode and ground cables divided by two) 50′	75′	100′	125′	150′	175′	200′	225′	250′	300′	350′	400′
100	4	4	2	2	1	1/0	1/0	2/0	2/0	3/0	4/0	4/0
150	4	2	1	1/0	2/0	3/0	3/0	4/0	4/0			
200	2	1	1/0	2/0	3/0	4/0	4/0					
250	1	1/0	2/0	3/0	4/0							
300	1/0	2/0	3/0	4/0								
350	1/0	2/0	4/0									
400	1/0	3/0	4/0									
450	2/0	3/0										
500	2/0	4/0										
550	3/0											
600	3/0											

Based on 4-Volt Drop

the resulting leak in the electrical circuit will as seriously affect the quality of welding as an inadequate cable.

The necessary four connections are those between the two cables to the welder, electrode holder to cable and ground clamp to cable. In addition, there may be splices in the cable itself.

In a welding circuit, like any other electrical circuit, only one bad connection is necessary to destroy the efficiency of the entire system. Many of the difficulties encountered in welding may be traced to the ground. Too often a weldor attempts to get by with an inefficient contact between the ground cable and the work. This results in both unsatisfactory welding and in a loss of time.

There are many ways in which the ground cable may be connected to the work. The prime requisite, though, is to insure a positive means of contact. On the job, you will find a variety of ground connections ranging from a steel hook, a bolted connection, tack-welded connections, spring clamp, C-clamps or a magnetic ground. Regardless of the type of connection, it must exert sufficient pressure on a clean contact area to complete the electrical circuit. Cleanliness of the contact area is of the utmost importance. An unclean contact may allow arcing between the ground and the work, which not only heats the ground connection but reflects itself in poor arcing characteristics between the electrode and the work.

The ground cable leads back to the welder to complete the circuit. The welder frame should also be grounded, or a person touching it accidentally may receive a noticeable shock. This grounding of the welder frame is not to be confused with the ground cable and its connection.

When you make a cable connection, whether it is to the ground clamp, electrode holder or merely between two cable lugs, always be careful to see that the socket in which the cable is to be inserted is of the correct size. Too small a socket will not allow all of the cable stranding to be inserted. This produces the same effect as using a smaller size of cable and results in a loss of electrical energy.

The manner in which cable connections are made depends somewhat on the type of lugs involved. A connection can either be brazed or made by a mechanical means. Brazing with a silver alloy or a copper alloy is generally preferred where high-amperage use over a long period of time is involved. However, mechanical connections made under high pressure may serve equally as well and are often used in field operations. All connections should be tight and should be properly taped. A loose connection heats the lug, which will in some instances become sufficiently hot to materially weaken the joint, especially if it has been soldered instead of brazed.

Cable connectors provide an ideal means of splicing cables. The most commonly used are plug-in connectors. This type makes it possible to disconnect lengths of cable without the use of a wrench. Bolted connections are used where the installation is of a permanent nature.

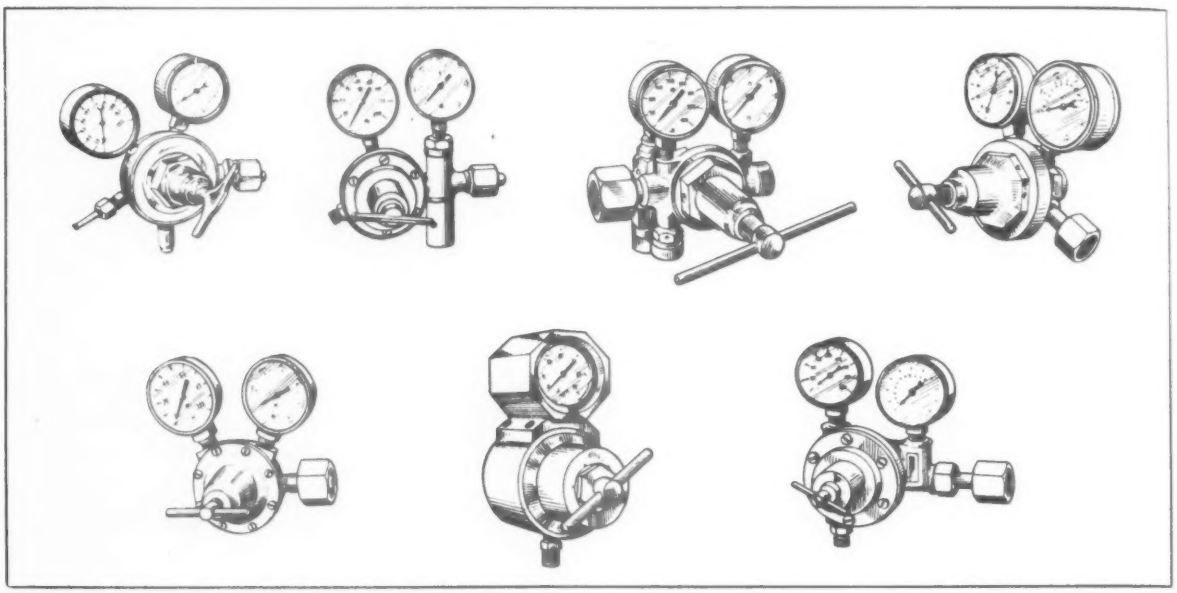
Whether the cable connection is of a splicer, plug-in or other type of connection, it should be checked for loose cable attachments. Tightness of plugs or connection parts will insure that the cable has the amperage it is expected to carry.

Current leakage in a welding circuit may show up in the welding machine, thereby misleading a welding operator as to the exact source of his trouble. Before assuming that a welding machine is "running hot" or otherwise at fault, make sure that the cable and cable connections are tight. Loose connections in the machine or overloaded usage can cause a burning of winding, insulation, armature or studs. Make a quick visual inspection of the entire welding circuit for cable breaks or shorts. Follow this up by checking the lugs and terminals bolted to the machine studs for tightness and possible corrosion at the contact points.

In checking the lugs and terminal connections, it is often necessary to go to some trouble to inspect them. They are usually hidden under covers or on the back of control panels where they are difficult to locate.

With regard to the terminal inspection, it is best to eliminate all wing nuts. It is difficult to finger-tighten wing nuts properly, and they can often work loose and cause difficulties. It is essential that the terminals be tight and the best way to obtain such tightness is to use square or hexagonal nuts and tighten them with a wrench.

It must be remembered a welding operation can be no better than the cables and cable connections which transmit the welding current to the point of use.



Regulators

A REGULATOR is attached to the cylinder valve of an oxygen, acetylene or other gas cylinder, and its purpose is to reduce the pressure within the cylinder to a suitable working pressure for the torch. Essential parts are a diaphragm, a seat, a nozzle, springs and a suitable case. The case is usually a brass forging; however, it may be made from an aluminum forging or from brass bar stock.

It works this way: The nozzle, which passes the high-pressure gas through the low-pressure chamber, is closed by a seat, usually actuated by one or more springs. This mechanism is placed on one side of the diaphragm. On the other side is a larger spring, controlled by an adjusting screw.

When you turn the adjusting screw to the right, it applies a force to the spring. The spring force is transmitted to the diaphragm and thence to the seat carriage. The seat is thus forced away from the nozzle, permitting a flow of gas into the chamber. As the high-pressure gas enters the low-pressure chamber, it increases the pressure on the diaphragm. Finally, the pressure has been increased to such an extent that it overcomes the force of the large spring on the other side of the diaphragm, allowing the seat to be closed by a small spring or springs, as the case may be. To put it in another way, the position of the seat over the nozzle is controlled by the balance between the force exerted by the large spring and the pressure of the gas in the chamber. This delicate balance maintains a constant flow through the regulator of gas at a preset pressure. The pressure may be increased or decreased as desired simply by changing the position of the adjusting screw.

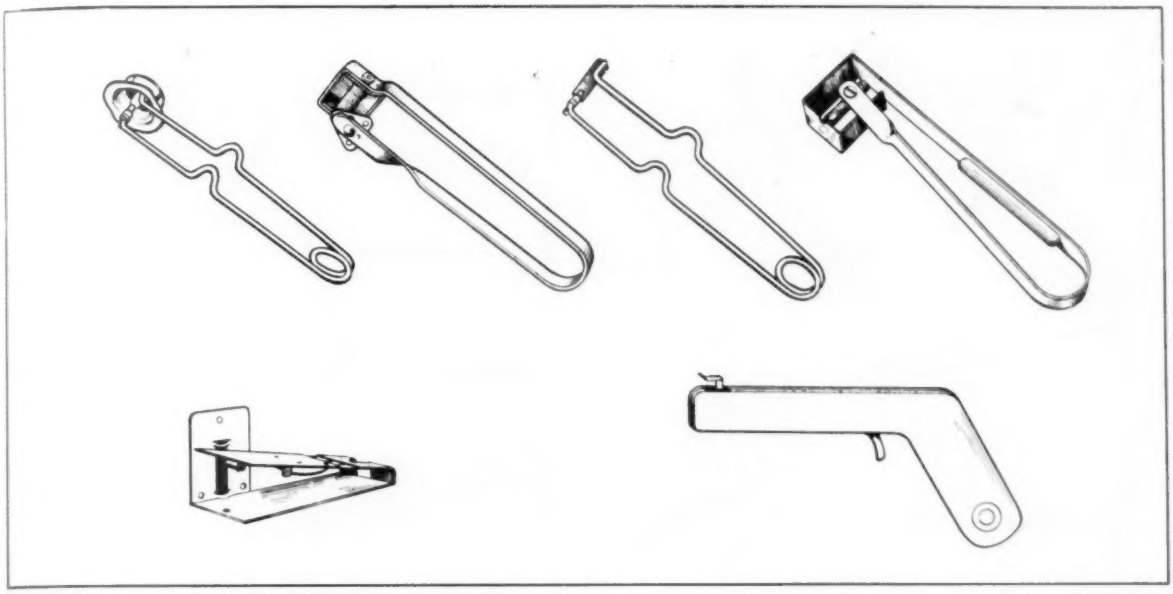
In addition to the valving mechanism, a regulator is provided with gauges so that the weldor may accurately determine the pressure of the gas he is using. The location of these gauges likewise varies with different regulators. Usually, they are placed side by side. Some regulators, however, have the gauges 180 deg apart, while one model has them back-to-back in a protective case. In the latter instance, the operator can only see one gauge at a time. This isn't any handicap, though, as only the low-pressure gauge holds interest during most welding and cutting.

In the case of the oxygen regulator, the reduction in pressure is usually from a cylinder pressure of 2,000 psi (full cylinder pressure) to a welding pressure of from 1 to 35 psi. The torch pressure varies according to the size of the tip and the type of torch. To play it safe, the gauge on the high-pressure side goes up to 3,000 psi and on the low-pressure side to 150 psi. Many regulators are used for both cutting and welding, and cutting requires higher oxygen pressures; hence the gauge limit of 150 psi.

Acetylene regulators reduce cylinder pressures of about 250 psi to torch pressures not ordinarily exceeding 11 or 12 psi. Gauges usually read up to 400 psi on the high-pressure side and 50 psi on the low-pressure side.

There are two general types of regulators: the single stage described above and another type, given various names, which provides two stages of regulation. The two-stage regulator is really two regulators in one, with two nozzles, two seats, etc., but only one adjusting screw. The usual first-stage reduction is from a maximum of 2,000 psi to an intermediate pressure of 250 psi; the second step of reduction is to torch pressure and is controlled by the adjusting screw.

Regulators, while ruggedly built, should be treated as delicate precision instruments. The safety of a weldor depends upon the accuracy with which regulators work. Take care of them, and they will work satisfactorily for you. They should not be oiled, nor should the gauges be tested with oil because of spontaneous combustion of oxygen in the presence of any type of oil.



Lighters and Cylinder Trucks

THERE ARE still some misguided welding and cutting operators who insist on making the lighting of a torch hazardous by using matches. The simplest and safest means is the spark lighter. Use it!

Most spark lighters consist of a piece of flint and a short length of steel file. These are mounted at opposite ends of a piece of spring wire. The file may be either a round or flat file, depending on the preference of the manufacturer. The flint, usually about 1/8 in. in diameter, is mounted on a threaded brass ferrule so that it can be replaced when worn.

The spring wire may be either round or flat and is bent in a U-shape to allow the flint and file to come into contact. When the flint scratches over the file, the necessary spark to ignite the gas flowing from the welding torch is produced.

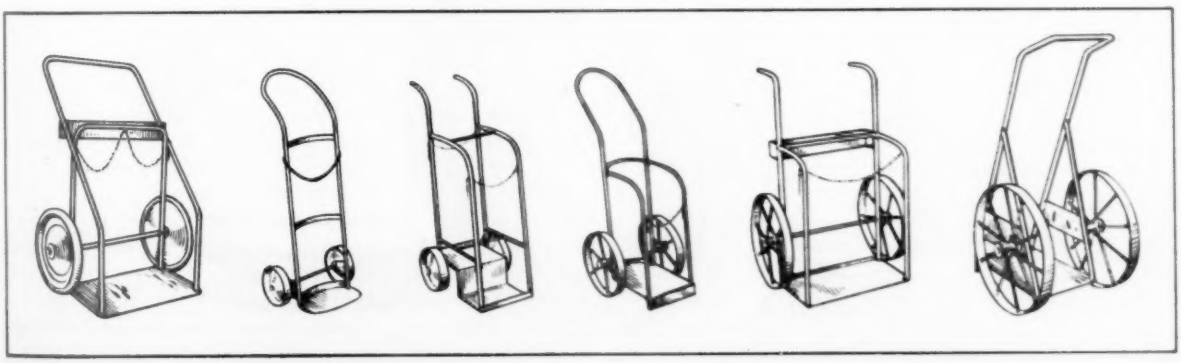
Styles of spring-wire lighters vary. Some are provided with a cup in which the gas is trapped, while others have several flints so mounted as to permit instant switching from a worn to a new flint.

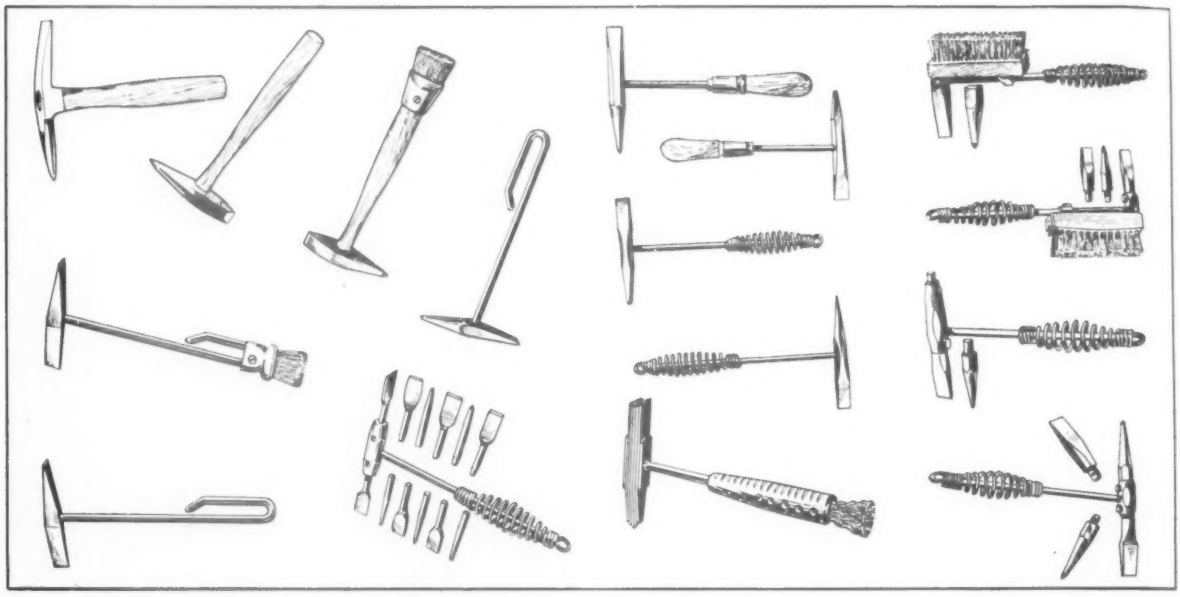
Spring-wire lighters are by no means the only types. Another lighter is shaped in the form of a pistol which shoots sparks as the trigger is pulled. Still another is a bench-mounted hinge type, which operates by pressing the upper hinge leaf downward with the torch.

In using a lighter of any type, care should be exercised to see that the torch is directed away from the operator, other shop personnel and inflammable material.

Where welding is carried on in a large area, particularly maintenance welding, a cylinder truck is absolutely essential to provide a convenient means of taking oxygen and acetylene to the job. All trucks should be designed to insure secure fastening of the cylinders in upright position and to provide ease in handling.

The most important quality to be found in a cylinder truck is strength: it should be sufficiently strong to support a heavy load while being moved over the rough shop floor. The larger the wheels, the rougher the surface over which the truck may be moved without undue effort. Stability is desired in a cylinder truck to minimize chances of the cylinders being knocked over. Balance is necessary to insure ease in moving cylinders. Many weldors also desire the truck to be fitted with a tool box to hold torches and other tools as well as welding rods.





Brushes and Chipping Hammers

TOOLS TO USE for weld cleaning depend upon the size of the job and the type of facilities available. Sandblasting, for instance, might be used in a large shop, but the equipment is expensive and quite bulky; consequently, its use is limited.

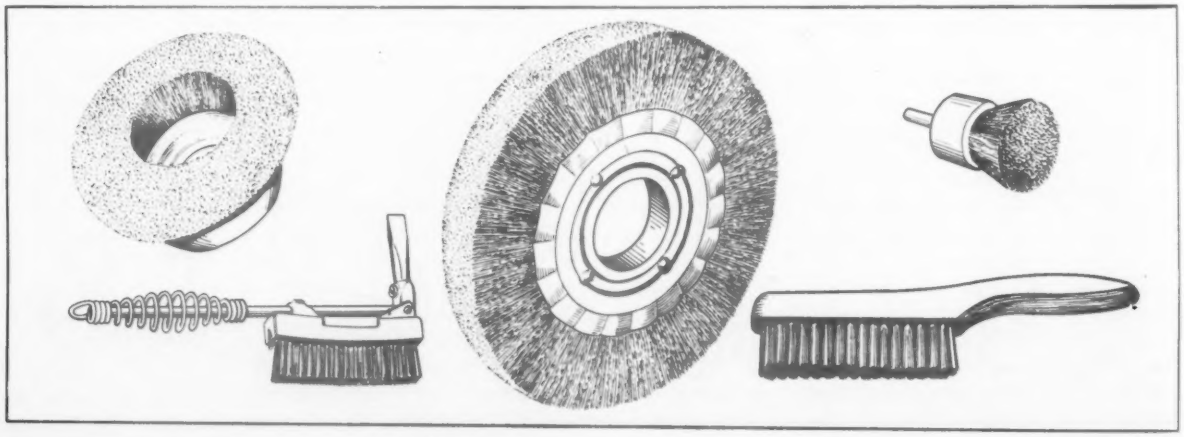
Power tools such as a rotary brush and the pneumatic or electric chipping hammer are more commonly used for cleaning. The most universal cleaning tools, however, are the manual brush and the hand chipping hammer. Manual cleaning may not be the quickest method, but manual tools do offer the advantages of relatively low cost and ease in replacement.

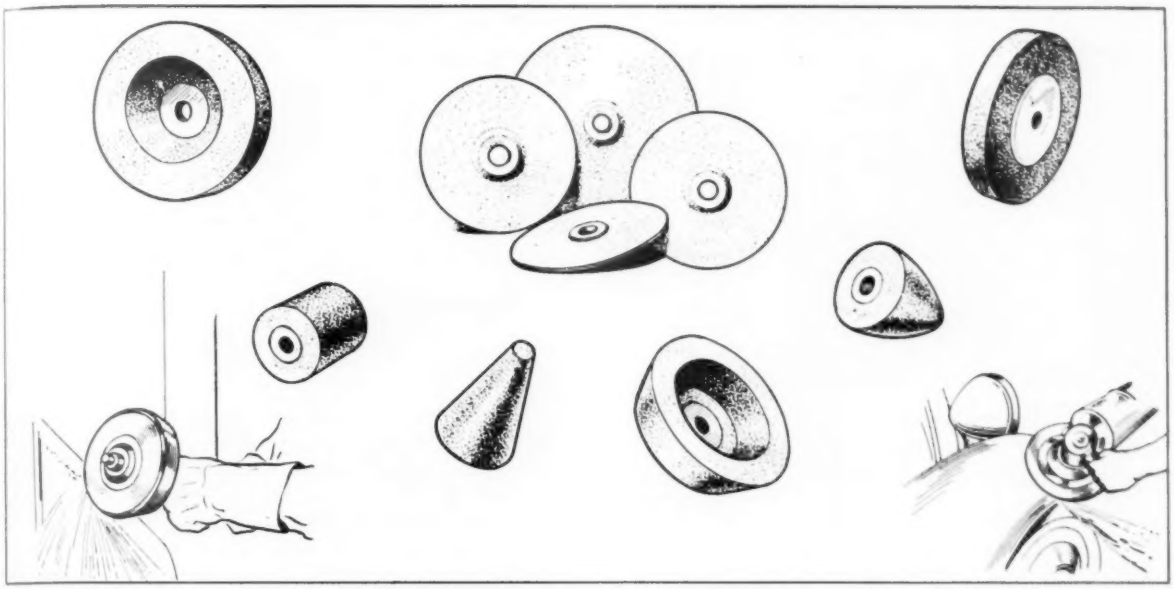
A chipping hammer may be equipped with either drift or chisel ends, chisels on each end set at right angles to each other or with adjustable chisels. Cleaning is accomplished by a peening action, which not only knocks off slag or scale but also has a tendency to compact the weld metal slightly. The peened weld is of higher density and is, consequently, sounder and stronger. The peening is usually followed by vigorous brushing with a stiff wire brush. Brushing insures the removal of all loose particles of slag, dirt and other foreign material from the weld, eliminating any possibility of inclusion in subsequent weld beads.

Cleaning is an important preweld function as well as one that should be carried on between beads and after welding. Preweld brushing and chipping will remove foreign materials such as scaly rust and dirt from the surface to be welded. Where oil is present, however, heating is often necessary to vaporize the oily surface and prevent the formation of gas pockets and blowholes during welding.

Between-beads cleaning is important to prevent slag inclusions. Postweld cleaning should be done to insure a neatly finished weld if for no other reason. It is very essential that the weld be properly cleaned if the finished weldment is to receive subsequent painting; otherwise, rapid deterioration of the finish may result.

Keep the material to be welded clean prior to welding, and keep the weld clean during and after welding for a sound, neat appearing weld!





Grinding Wheels and Discs

WHAT TYPE of grinding wheel to use will in large part be determined by the degree of finish desired. Should the weldment be painted or enameled, the surface should not be ground too smooth. For this reason, it is not unusual to shotblast the weldment after weld grinding to produce a roughened surface to which paint or enamel will adhere. If the weldment is to be polished after grinding, care must be taken to obtain a smooth finish in the grinding operation.

Most of the grinding undertaken in connection with welding is done with horizontal portable grinders mounted with straight or cone-shaped wheels. Vertical portable grinders using flared or straight cupped wheels are sometimes used on flat surfaces or when the grinder is to be fitted with sanding discs for sanding operations.

In selecting a grinding wheel, it is wise to pick the one that shows the highest rate of production (material removal) even though it may be the fastest to wear away. The cost of grinding wheels is usually less than that of labor, power and overhead. Therefore, increasing production by means of faster cutting wheels on more powerful machines tends to reduce costs.

The portable grinder used in weld-finishing operations is usually a high-speed machine—up to 9,500 surface feet per minute—making it necessary to use resinoid, rubber or shellac bond wheels. The rate at which excessive weld metal is removed is in direct ratio to speed; thus about 50% higher production is to be expected from wheels with a rating of 9,000 surface ft per minute than from those with maximum speed of about 6,000 surface ft per minute.

Because of the variety of work handled in a welding shop, several different sizes and shapes of wheels are required for portable grinders. Flared cup wheels 6 or 4½ x 2 x ⅝ in., 1-in. rim, ¾-in. back, mounted on a ⅝-in. threaded steel bushing or with ⅝-in. holes are commonly used. For straight cup wheels, the accepted size is 6 x 1½ x ⅝ in., with a 2-in. rim and ¾-in. back, mounted on a ⅝-in. threaded steel bushing or with a ⅝-in. hole. For general work, such a cup wheel is usually a 16 or 20 grit, medium-hard grade of aluminum oxide with a resinoid bond. For stainless steel and other polished work, it is advisable to use a 20 or 24 grit aluminum-oxide wheel, rubber bond in a slightly harder grade.

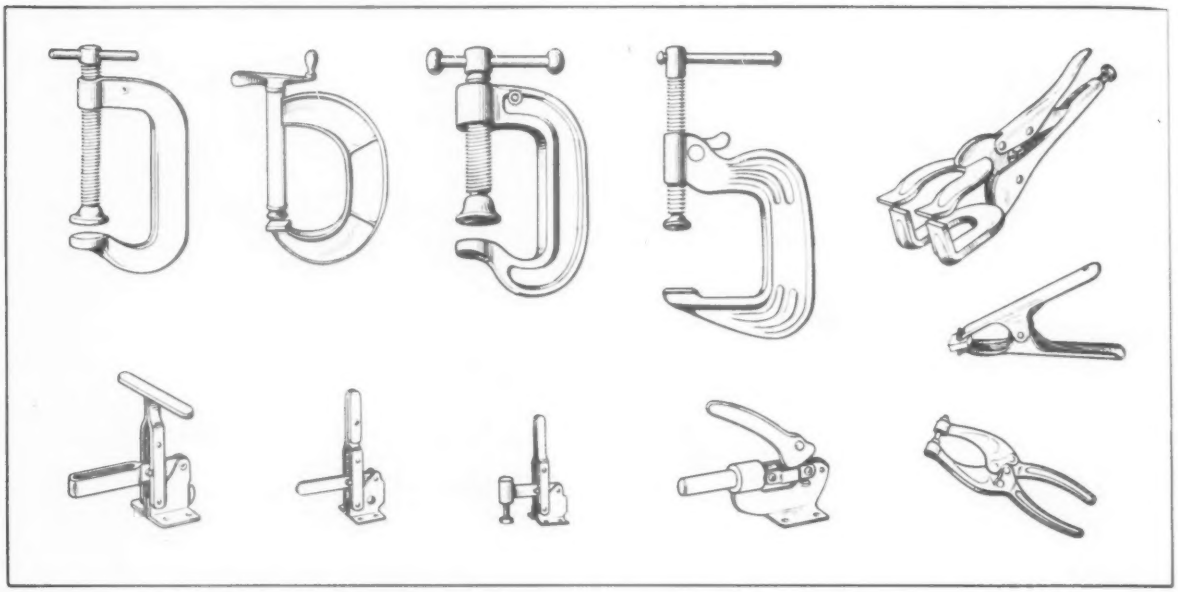
The most common sizes of straight grinding wheels are 6 x 1 x ⅝ in. and 8 x 1 x ⅝ in., though thinner wheels of the same diameter are sometimes used. The thicker wheels are usually 16 or 20 grit and the thinner ones 20 or 24. For carbon or alloy steel, aluminum-oxide abrasive and a fairly hard grade of resinoid bond is recommended. For stainless steel, 20 or 24 grit, hard-rubber bond seems to produce the best results.

Preferred cone wheels are 16 grit, fairly hard, resinoid bond, aluminum-oxide abrasive. The wheels ordinarily used for grinding welds at floor stands are 16 grit, aluminum-oxide, medium-grade rubber bond. Swing frame grinders usually require a wheel with a more coarse (14) grit and somewhat harder resinoid or rubber bond.

For polishing welded parts, the portable sander is widely used with a 7 or 9 in. flexible fibre-back disc. Here, again, the recommended speed is 9,500 surface ft per minute. On discs having raised hubs, the speed of the 9-in. disc should be between 4,000 and 5,500 rpm and on the 7-in. disc 5,000 and 7,000 rpm.

In polishing welds, the luster depends chiefly on the freedom of the finished surface from minute foreign particles. Possibility of impurities being left on the surface may be minimized by using a good grade of manufactured abrasive grain.

In grinding and finishing welds, as in so many other industrial operations, the quality of the material with which the craftsman has to work often affects the price of production. Lower cost may be obtained through quality products.



Clamping Devices

A CLAMPING device is of prime importance to the weldor, and there are many types of clamps in use about our welding shops. Some of these devices are made in the shop for use in connection with special welding tables or faceplates and may be merely "dogs" or "wedges." There are also hook bolts, three-point bearing clamps, lever clamps, swinging strap clamps and cam-operated clamps, all of which are usually special in nature and products of the shop. C-clamps will be found in every shop. In recent years, these have been augmented by specially designed pliers, hand vises, toggle clamps, angle clamps and other clamping devices for use in weld shops.

When selecting a clamp for use in welding (or any other operation requiring pieces to be held in alignment), there are seven important considerations: the size and character of the workpiece; condition of the workpiece; the strength of the clamp; ease and rapidity of operation; means and point of applying pressure; frequency of set-up; method of preventing the clamp from loosening during operation. In addition, it is also desirable to use a clamping device that will not be made inoperative by weld spatter if the clamp is to be used in close proximity to the actual welding operation. In the early days, weld spatter would adhere to the threads of C-clamps and present quite a problem. This has now been overcome by either shielding the threads with a sleeve, coating the threads with an antispatter material or making the screw of a material to which weld spatter does not readily adhere.

In the case of a welding fixture, the time required to load and unload the work is largely determined by the means of clamping employed. The vital role of clamping in production is often overlooked even though it is a key factor in production cost. It must also be remembered that faulty clamping may easily result in spoiled work and possible injury to workers. It is difficult to specify sight unseen a particular clamp to use on a fixture because widely varying clamping methods have proved satisfactory under different welding conditions. One thing to keep in mind, though, is that the clamping pressure should be applied directly over a solid portion or a rib to avoid deflection of the part with resultant misalignment. If thin-gauge material or a frail piece of work is to be held, care must be exercised not to spring the piece by undue clamping pressure. Often such a piece will require many delicate clamps to hold it in place. Oddly enough, only two clamps may suffice for an extremely heavy weldment since the weight of the workpiece assists the clamping device in the holding.

Quick-acting clamping devices are of great assistance in setting up work for welding. The more common of the quick-acting clamps are toggle clamps. Clamping pliers, hand vises and even some C-clamps also fall into this category. If high production at low cost is the objective desired, the clamping device must be built in as an integral part of a jig.

Jigs and fixtures are tools for welding that require more space for treatment than is available in this special section. Their proper design will permit the easy, rapid assembly of a weldment with the utmost accuracy. Welding fixtures are often classified as either set-up fixtures or final assembly fixtures. Some fixtures fail to fall in either classification as they serve both purposes. The purpose for which the fixture is to be used should determine both the fixture design and the clamping devices employed.

When production economy is to be considered, proper design is most important in connection with the set-up fixture. Proper design of the set-up fixture will insure: (1) that a minimum amount of labor will be involved in alignment and tack welding and (2) that the parts will be located accurately in relation to each other to avoid poor fit-ups. If these essential conditions are not met in a fixture, the production rate will go down and costs up.

AWS Meets in Cleveland

October 16-21 will be a big week for those lucky enough to go to the 30th annual meeting of the American Welding Society. A total 79 technical papers will cover all phases of welding and cutting

BY CLYDE B. CLASON

HOTEL CLEVELAND, Public Square, will be headquarters for Welding Society's 30th convention

MEETING at the Hotel Cleveland, in Cleveland, from Sunday, October 16 through Friday, October 21, delegates to the American Welding Society's 30th annual convention won't be allowed much time for horseplay. Practically every waking minute will be taken up by 21 technical sessions, a three-afternoon educational lecture series and evenings fully scheduled with convention activities. Satan should find little mischief for idle hands at this soberly planned convention.

Though registration begins on Sunday afternoon, 3 to 5 p.m., there will be no customary Sunday afternoon President's Reception to open up the convention. That event has been postponed to Tuesday evening, 8 p.m., and will be staged in connection with a subscription buffet dinner and a pay-as-you-go bar. This will replace the annual banquet.

The educational lecture series will be held on Monday, Tuesday and Wednesday afternoons, 4:30 to 6:00 p.m., at Parlor B, third floor of the Cleveland public auditorium, several blocks away from the Hotel Cleveland where the technical sessions are being held. This series is under the chairmanship of Dr. G. E. Doan, Lehigh University, while lectures are to be given by H. W. Pierce, New York Shipbuilding Corp., on the subject, "Designing for Welding." The educational lecture idea proved very popular when it was inaugurated last year.

In keeping with convention tradition, prize awards and the Adams Lecture are scheduled for Monday evening, 8:00 p.m. George N. Sieger, president of the American Welding Society, will serve as chairman and M. S. Shane, chairman of the convention committee, as co-chairman. After the awards of prizes and medals, the 1949 Adams Lecture will be given by W. M. Wilson, University of Illinois. His subject is the advantages and disadvantages of electric welding as a means of fabricating steel structures.

The annual business meeting begins at 2:00 p.m. Wednesday and will be followed immediately by the board of directors' meeting. The section officers' conference and the university conference will both be held on Wednesday evening at 7:30 p.m. The convention delegate will be given Thursday afternoon off to permit him to attend the Metal Show.

Thursday evening has been alloted to a meeting on "The Importance of Welding to Management, the Engineer and the Public," at which Col. Willard T. Chevalier, executive assistant to the president, McGraw-Hill Publishing Co., Inc., will be principal speaker. James F. Lincoln, president, The Lincoln Electric Co., will serve as meeting chairman.

The technical sessions will be held at 9:30 a.m. or 2 p.m. on Monday morning, Monday afternoon, Tuesday morning, Tuesday afternoon, Wednesday morning, Thursday morning and Friday morning. As usual, three simultaneous sessions will be held during each of the seven periods. A total of 79 papers will be presented, making this the heaviest technical program since the old wartime convention sessions.

MONDAY MORNING

The Monday morning sessions include structural design, pressure vessels, hard-facing and flame-hardening. LaMotte Grover, Air Reduction Sales Co., will act as chairman of the structural design session, and F. L. Plummer, Hammond Iron Works, as co-chairman. Papers will be given by Ned L. Ashton, State University of Iowa (welded highway bridge); Robert E. Robertson, Jr., Saxe, Williar & Robertson (welded buildings); Martin P. Korn, consulting engineer (welded rigid frames for New York subways); and A. Waidelich, The Austin Co. (strain gauge test of welded truss).

A. C. Weigel, Combustion Engineering-Superheater, Inc., will serve as chairman of the pressure vessels session, and G. M. Trefts, Farrar & Trefts, Inc., as co-chairman. Papers are to be given by Walter Samans, chairman, pressure vessel research committee; S. V. Williams, Struthers-Wells Corp., A. J. Hopper, Welding Engineers, Inc., and A. B. Bagsar, Sun Oil Co.

Hard-facing and flame-hardening will be under R. P. Tarbell, Scott-Tarbell, Inc., as chairman, and G. H. Meyer, The Linde Air Products Co., as co-chairman. Hot hardness of hard-facing alloys will be discussed by Howard S. Avery, American Brake Shoe Co.; automatic hard-facing by Turner G. Brashear, Jr., Leader Welding and Mfg. Co.; applications in the steel industry by J. J. Barry, Air Reduction Sales Co., and flame-hardening of large-diameter rounds by S. Smith, Air Reduction Sales Co.

MONDAY AFTERNOON

Afternoon sessions will be on non-ferrous metals, education and research. Chairman of the non-ferrous sessions is O. B. J. Fraser, The Inter-

O. B. J. FRASER, president of the American Welding Society, 1949-50

HARRY W. PIERCE, first vice-president of AWS for 1949-1950

C. H. JENNINGS, of Westinghouse, was elected second vice-president

national Nickel Co., Inc., and co chairman is F. G. Flocke, The Thornton Co. Subjects are the arc welding of molybdenum by I. S. Goodman, Westinghouse Electric Corp.; welding of high-nickel alloys to other metals by G. R. Pease and H. B. Bott, both of International Nickel; seam welding Monel to steel by Ernest F. Nippes, Allan R. Pfluger and Gerald M. Slaughter, Rensselaer Polytechnic Institute.

Education is under R. A. Wynat, Rensselaer Polytechnic Institute, chairman, and Gilbert Doan, Lehigh University, co-chairman. Papers are to be given by Professor R. S. Green, Ohio State University; Acting Dean Allen C. Tyler, of LeTourneau Technical Institute, and Frank W. Scott, of Marquette Mfg. Co., Inc.

Ross J. Yarrow, Republic Structural Iron Works Co., and L. K Stringham, The Lincoln Electric Co., serve as chairman and co-chairman of the research session. On the program are B. B. Day, statistician, director's staff, U. S. Naval Engineering Experimental Station; K. J. Stodden and E. P. Klier, the Pennsylvania State College; J. Lyell Wilson, American Bureau of Shipping.

Tuesday Morning

Tuesday morning begins a two-session symposium on ship structure research and a three-session program of resistance welding. The first installment of the symposium is under chairmanship of Captain C. M. Tooke, Bureau of Ships, USN. Commander R. D. Schmidtman, U. S. Coast Guard, will be co-chairman.

The work of the ship structure committee will be introduced by Rear Admiral Ellis Reed-Hill, USCG, after which papers will be presented by Professor S. T. Carpenter and Captain W. P. Roop (USN Ret.), of Swarthmore College; by Dr. C. F. Tipper, University of Cambridge, England; by E. M. MacCutcheon, C. L. Pittiglio, of David Taylor Model Basin, USN, and R. H. Raring, National Research Council; and by Noah Kahn and Emil Imbembo, New York Naval Shipyard.

Resistance welding will be under T. Embury Jones, Precision Welder & Machine Co., as chairman, and R. E. Powell, Western Electric Co., as co-chairman. Thomas J. Crawford, Progressive Welder Co., will discuss the homopolar generator system. Other authors are William N. Platte, Westinghouse Electric Corp.; E. Sirabian, Arnold Schwinn & Co., and W. K. Boice, General Electric Co. Mr. Platte and Mr. Sirabian will discuss different aspects of flash welding, while Mr. Boice will analyze frequency-changer welder circuits.

A session on machinery welding will be chairmanned by Charles H. Jennings, Westinghouse Electric Corp., and co-chairmanned by L. S. McPhee, Whiting Corp. On the program are: Joseph A. Cunningham, J. A. Cunningham Equipment, Inc. (aluminum-bronze electrodes); Anthony K. Pandjiris, Pandjiris Weldment Co. (weldment design); E. R. McClung, Lukenweld, Inc. (alloy-steel shovel buckets); and Omer Blodgett, The Lincoln Electric Co. (lowering cost of welded construction).

Tuesday Afternoon

Ship structure research and resistance welding both continue on Tuesday afternoon. There will also be a miscellaneous session under chairmanship of L. C. Bibber, Carnegie-Illinois Steel Corp., and co-chairmanship of J. J. Chyle, A. O. Smith Corp. At the latter session, a paper on the welding of zinc-base die castings will be given by Roland H. Ogden, Aladdin Rod & Flux Mfg. Co., and a paper on the silver-alloy brazing of stainless by C. H. Chatfield and A. W. Swift, Handy and Harman. F .A. Upson, Standard Oil Co. of Indiana, will discuss magnetic-particle inspection of storage tanks, and G. L. Mikhalapov, Metallurgical Research and Development Co., Inc., high-energy loading methods of testing steel plates and weldments.

The ship structure research symposium is under Finn Jonassen, National Research Council, chairman, and J. Lyell Wilson, American Bureau of Shipping, co-chairman. On the program are: L. J. Klingler and L. J. Ebert, Case Institute of Technology; C. B. Voldrich and P. J. Rieppel, Battelle Memorial Institute; Professors J. M. Lessells and H. E. Jacques, Massachusetts Institute of Technology; and W. H. Bruckner and N. M. Newmark, Univerity of Illinois.

Resistance welding is under R. H. Aborn, U. S. Steel Corp., chairman, and R. T. Gillette, General Electric Co., co-chairman. Spot-weld consistency studies will be presented by Julius Heuschkel and H. C. Bitzer, Westinghouse Research Laboratories.

I. W. Johnson, General Electric Co., will discuss the effect of the new method of slope control on spot and projection welding. Spot welding of heavy-gauge structural steel will be handled by Ernest F. Nippes and R. F. Underhill, Jr., Rensselaer Polytechnic Institute.

Wednesday Morning

The third and final resistance welding session is scheduled for Wednesday morning under Wilson Scott, Westinghouse Electric Corp., chairman, and B. L. Wise, National Electric Welding Machine Co., co-chairman. Papers will be given by Professor Georges Welter, Ecole Polytechnique, Montreal (fatigue tests); M. L. Begeman, Millard L. Hipple and L. Cullum, Jr., University of Texas (spot welding galvanized steel); W. B. Kouwenhoven and William T. Sackett, Jr., Johns Hopkins University (non-uniform current flow); and C. H. Davis, Jr., The Budd Co. (portable r-w tools).

Sessions on apparatus and on aluminum will also be held Wednesday morning. The apparatus session is under H. O. Hill, Bethlehem Steel Co., chairman, and A. M. Setapen, Handy and Harman, co-chairman. Design features of a welding generator with controlled reactance will be discussed by J. M. Tyrner, Air Reduction Sales Co., and O. Kobel, G. D. Peters & Co. of Canada, Ltd. Measurement of flux densities in magnetic-particle inspection will be covered by T. E. Hamill, Naval Gun Factory. S. Oestreicher, Harnischfeger Corp., will talk on economical arc welding.

Aluminum will be under G. O. Hoglund, Aluminum Co. of America, chairman, and Dana W. Smith, The Permanente Metals Corp., co-chairman. Papers by Fritz Albrecht, The Glenn L. Martin Co., and F. H. Stevenson, Modern Metal Spinning & Mfg. Co., will be devoted to the metal-arc and inert-arc processes, respectively, while spot welds in Alclad 24 S-T3 will be the subject of J. C. Barrett, The Glenn L. Martin Co.

Thursday Morning

Arcs and electrodes, railroad welding and weldability make a full program for Thursday. J. H. Humberstone, Air Reduction Sales Co., will serve as chairman of the arcs and electrodes session, and O. T. Barnett, Metal & Thermit Corp., as co-chairman. Papers will be given by Dr. R. C. McMaster, D. C. Martin and A. Leatherman, Battelle Memorial Institute (metal transfer analyzer); Dr. T. Benjamin Jones, Johns Hopkins University (heat effects in anode spots of high-current arcs); F. R. Strate, Air Reduction Sales Co., and R. I. Strough, Arcrods Corp. (mild-steel welding electrodes); and Clarence E. Jackson and A. E. Shrubsall, Union Carbide & Carbon Research Laboratories (energy distribution in arc welding).

Railroad session is under Roy F. Johnson, Pullman-Standard Car Mfg. Co., chairman, and A. G. Oehler, editor, *Railway Mechanical Engineer*, co-chairman. L. E. Grant, Chicago, Milwaukee, St. Paul & Pacific RR., will talk on the evolution of the welded freight car; Lem Adams, Oxweld Railroad Service Co., on oxyacetylene pressure-welded rail; E. DiLiberti, Air Reduction Sales Co., on arc welding in railroad shops; and H. E. Gannett, Chicago, Burlington & Quincy RR., on inert-gas welding in railroad repair.

A. B. Kinzel, Union Carbide & Carbon Research Laboratories, is chairman of the weldability session, and R. E. Somers, Bethlehem Steel Co., co-chairman. On the program are: W. H. Bruckner and S. W. Sandberg, University of Illinois; Bela Ronay, U. S. Naval Engineering Experimental Station; A. E. Flanigan, University of California, Los Angeles; and Ernest F. Nippes and Warren Savage, Rensselaer Polytechnic Institute.

Friday Morning

Final three technical sessions are on inert-gas welding, stainless steel and gas cutting. The inert-gas session is chairmanned by C. A. Loomis, Bureau of Ships, USN. F. J. Pilia and R. H. Bennewitz, The Linde Air Products Co., will discuss inert-arc welding in the automotive industry; A. Muller, G. J. Gibson and E. H. Roper, Air Reduction Sales Co., the inert-gas and metal-arc process in general; H. O. Jones, Air Reduction Sales Co., automatic applications; and M. J. Conway, General Electric Co., applications for helium.

Stainless steel session is under W. O. Binder, Union Carbide and Carbon Research Laboratories, chairman, and E. Vom Steeg, General Electric Co., co-chairman. Papers are: Corrosion resistance of molybdenum-bearing stainless steel by R. D. Thomas Jr., and Anton L. Schaeffler, Arcos Corp.; welding of stainless-clad by Perry C. Arnold, Chicago Bridge & Iron Co.; resistance welding of stainless trailer components by Byron Gates, The Budd Co.; stainless fabrication by inert-arc welding by Charles D. Bonifield, the Globe Co.

J. J. Crowe, Air Reduction Sales Co., acts as chairman of the flame-cutting session, and H. E. Rockefeller, The Linde Air Products Co., as co-chairman. W. Begerow and A. H. Yoch, both of Airco, will tell of new developments in flame-cutting machines, while William O. Springer, Joseph T. Ryerson & Son, Inc., will tell how the steel warehouse can do shape cutting with electronic tracers. Flame-cutting in general is the subject of James T. Lewis, Lewis Welding & Engineering Corp., and powder cutting and scarfing will be covered by C. W. Powell, Republic Steel.

New Officers

New officers and directors elected for the year 1949-50 are:

President: O. B. J. Fraser, The International Nickel Co., Inc., New York, N. Y.

First vice-president: H. W. Pierce, New York Shipbuilding Corp., Camden, N. J.

Second vice-president: Charles H. Jennings, Westinghouse Electric Corp., Buffalo.

Board of directors (for three years): L. C. Bibber, Carnegie-Illinois Steel Corp., Pittsburgh; A. F. Davis, The Lincoln Electric Co., Cleveland; A. J. Moses, Combustion Engineering-Superheater, Inc., Chattanooga, Tenn.; Gilbert S. Schaller, University of Washington, Seattle, Wash.

District vice-presidents are:

District 1 (New York and New England): H. S. Swan, American Locomotive Co., Schenectady, N. Y.

District 3 (Southern): L. C. Stiles, Chicago Bridge & Iron Co., Birmingham, Ala.

District 5 (Midwestern): John Grodrian, Bendix Products Div., Bendix Aviation, South Bend, Ind.

District 7 (Western): W. F. Boyle, The Pelton Water Wheel Co., San Francisco, Calif.

DENSE CLOUDS of fume are an indication that this weldor needs the protection of a local exhaust system

HEAVY SECTIONS make heavy fumes. A check should be made to see if general shop ventilation is adequate

Welding and C

Part one of this two-part article discusses the fumes produced from the welding and cutting of mild steel and their effect on the general health of the weldor, also ventilation requirements

BY CLYDE B. CLASON

MEDICAL science has thoroughly investigated the effects of fumes produced by arc and gas welding and has given them an entirely clean bill of health—or one so very close to it as to make no difference if welding is done under proper conditions of ventilation. An extensive review of current medical literature discloses these salient facts:

Welding fumes are not a cause of pneumonia.

They do not predispose a weldor to tuberculosis.

They do not result in silicosis.

No connection exists between welding fumes and stomach ulcers.

Toxic gases are not evolved from electrode coatings; comparatively, welding is safer with coated electrodes than with bare wire.

With the single exception of lead poisoning, there is no such thing as a chronic ailment that could be caused by welding. Illnesses such as metal fume fever are of short duration and have no cumulative effects.

Arc weldor's siderosis, found sometimes in weldors who have been working continuously at their trade for six years or more, is not an occupational hazard. It has been well studied by medical authorities and pronounced "benign"; i.e., not harmful, in the medical sense of the word.

Shipyard Study

Most of the literature on welding fumes deals with shipyard welding. The most ambitious production along this line is the 200-page Public Health Bulletin No. 298, "Health of Arc Weldors in Steel Ship Construction," issued by the United States Public Health Service in late 1947. This bulletin reports the results of medical examinations made in seven Atlantic, Pacific and Gulf Coast shipyards by the Industrial Hygiene Division, U. S. Public Health Service, in coöperation with the U. S. Maritime Commission and the U. S. Navy. Some 4,650 persons (2,950 men and 1,700 women) were examined. About 21% of these were non-weldors, who were included in the study for control purposes.

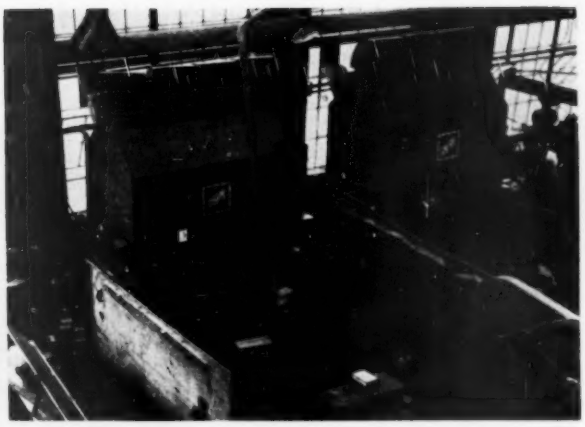
Analyses were also made of the fume and gases in varied workplaces throughout eight shipyards. Some 1,767 samples of iron and total fume were taken, 278 samples for zinc and 25 for lead. In general, the concentrations of welding fume and gas observed were relatively low. Since ships are harder to ventilate than open factories, it may be safely assumed that no worse conditions will be found throughout industry.

Few Symptoms for Weldors

Only a few significant clinical symptoms which might be related to occupational exposures were observed among the workers examined. Among these were a respiratory symptom complex, lowered blood pressure and welding burns. The upper respiratory symptom complex occurred slightly more frequently among weldors than among non-weldors. Symptoms included pharyngitis, rhinitis, sinusitis and sometimes tracheobronchitis, which fancy words boil down to hoarseness, sore throat, inflammation of the nose and coughing, from the layman's point of view. Concludes the survey (page 101): "The slight difference in signs of pharyngitis (sore throat) and rhinitis (nose inflammation) between weldors and non-weldors and the infrequent finding of nasal ulceration and perforation indicate that the local effect of welding fume on the tissues at the portal of entry into the body is of little or no significance."

The various nose and throat ailments noted above are usually mild and non-disabling, and their symptoms were indistinguishable in most respects from upper respiratory

CUTTING FUMES aren't so dense as the fumes of arc welding but may become a problem in confined spaces



WELDING AREA at Dreis and Krump, Chicago, is kept under pressure to force fumes up and out roof windows

Cutting Fumes—I

affections induced by allergic or other irritant toxic agents or by infections. Observations failed to reveal that welding fume irritated all weldors but suggested rather that the inflammations noted arose from infectious foci and other sources and might have been aggravated by exposure to welding fume.

There was no indication that welding fume, under the conditions observed, predisposed workers to pulmonary tuberculosis. Gastrointestinal symptoms (stomach ache) were infrequent.

Arc weldor's siderosis (this medical term denotes an ailment caused by the inhalation of iron particles) was diagnosed in only 61 or 3% of the male weldors. Even though iron oxide is the principal component of welding fume, the fact that so few weldors had siderosis is scarcely surprising. The observed exposures to fumes were short, whereas, according to Sander, six to ten years of steady, confined and poorly ventilated work is usually necessary for the disease to become clearly manifest.

Slightly lower blood pressure was observed among weldors than among non-weldors. The difference was too small to make a clinical impression on the examining physician at the time of the individual examinations, and hence no laboratory tests were made to establish or identify possible depressor or antipressor agents. Detailed studies failed to reveal any marked blood abnormalities among weldors.

To sum it all up, the results of this broad study indicate that hazards to the health of arc weldors working on mild steel are negligible when adequate ventilation is provided.

Weldors and Pneumonia

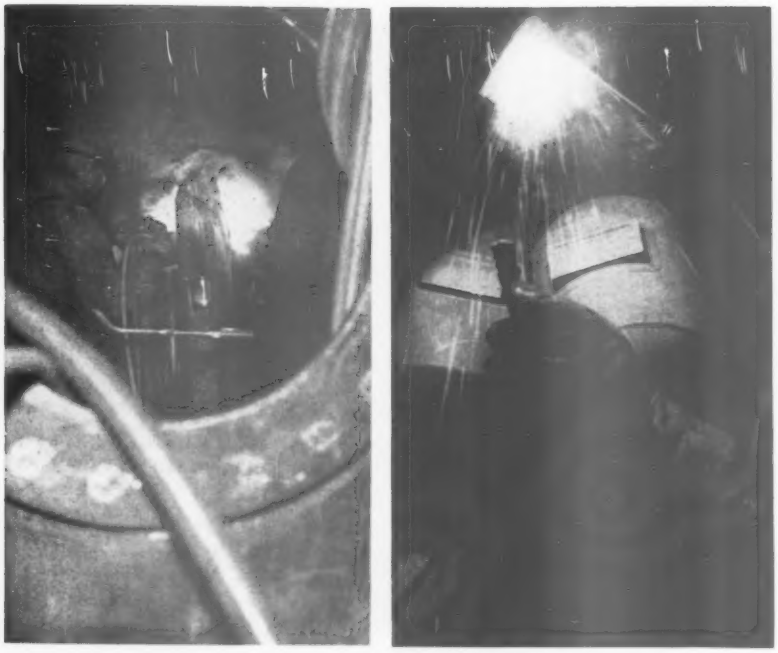
Pneumonia in the shipbuilding industry was studied statistically by Drs. Morris F. Collen, Gerhardt L. Dybdahl and George F. O'Brien, department of medicine, Permanente Foundation Hospital, Oakland, Calif. Through a health plan, this hospital furnished complete medical care to 90,000 employees of the four Kaiser Richmond shipyards during the time when west coast shipbuilding was at its peak. In the 12-month period from September, 1942, to September, 1943, the hospital treated 864 cases of pneumonia. Extensive records were compiled, and it is the opinion of the three doctors named above that no comparable figures are available for a similar group.

Pneumonia cases were classified according to occupation. There were 159 cases of pneumonia among weldors, representing 18.4% of the total 864 pneumonias. Weldors, however, constituted 18.3% of the total shipyard workers so that the incidence of pneumonia was no different among weldors than among other workers in the Richmond shipyards.

If there is any fault to be found statistically with the Collen-Dybdahl-O'Brien report, it is that the great majority of workers (71.3%) had been employed at the shipyard for less than six months, and the percentage of pneumonia patients who had worked at the shipyards for but a short time was likewise large. Any long-term tendency of welding fumes to predispose workers to pneumonia would thus be masked.

This flaw in the statistical reasoning was corrected by a second report, issued by Dr. Collen after the study had been continued over a 32-month period from September, 1942, to May, 1945. This second study left unchanged the previous conclusion that there is no relationship between the incidence of pneumonia and occupation. Like the earlier statistics, the second report demonstrated that the incidence rate of pneumonia among shipyard workers was independent of the type of work done. Furthermore, workers employed under one year had a significantly higher incidence of pneumonia (16.0) than those employed over one year (10.2). These figures definitely do not indicate any long-term predisposition to pneumonia; quite the contrary.

When the study was carried over the 32-month period, a total of 2,794 consecutive patients with pneumonia had been treated, of which 426 cases



OXIDES OF NITROGEN may become a health hazard when gas or arc welding is to be done in such places as a ship hold or the interior of a tank

were among weldors. Annual incidence per 1,000 employees was thus 13.2 for weldors as compared to an annual incidence of 12.4 for the total number of cases recorded. The annual incidence per 1,000 employees was higher for boilermakers (13.7), carpenters (16.3), electricians (15.2), laborers (15.9), painters (17.9) and pipe fitters (19.4) than it was for weldors. It was considerably lower for flame-cutters—only 8.7. Flame-cutters also showed a case fatality rate of 2.6, whereas the case fatality rate for weldors was 5.2 and for all shipyard workers was 5.8.

The death rate for shipyard weldors was also very close to that of all other shipyard workers. Dr. Collen concluded that the pneumonia which occurred in shipyard weldors was in no way different from that occurring in other shipyard workers. The two groups of cases "were approximately equal in severity of illness, required the same number of days for treatment and showed no difference in incidence of complicating conditions."

Tuberculosis or Siderosis?

If you are a weldor who has been engaged continuously at the trade for six years or more, you may receive an unpleasant surprise when you have your chest examined by X-ray. Dr. J. A. Groh, of the Lutheran Hospital, Cleveland, X-rayed the chests of 83 weldors working in a local industrial plant and found that 71% of these cases showed "a peculiar fine nodulation evenly distributed over the lung fields." The appearance is so similar to "tuberculosis of a miliary type" that "differentiation on the X-ray film alone would be difficult."

Unless the general practitioner is able to know and recognize this condition of arc weldor's lung, he may make a mistaken diagnosis of tuberculosis and so cause unnecessary medical anguish and medical expense to his weldor patient.

"In this study," remarks Dr. Groh, "we were impressed by the complete absence of active pulmonary tuberculosis . . . all the evidence available thus far indicates that the condition of arc weldor's lung does not predispose to pulmonary tuberculosis or reactivate an old arrested tuberculosis of the lungs."

In this connection, Dr. O. A. Sander reports the case of a weldor who "appears to have arrested a reinfection tuberculous lesion spontaneously while continuing his welding."

The mottled appearance of some weldors' chests under X-ray is due to iron oxide particles "deposited along the pulmonary vessels into lymphatic channels and also in the regional lymph nodes." The resulting pigmentation of the lung has been likened to a tattoo of the skin and is about as harmless.

Unless your mottled chest is accompanied by such clinical symptoms as sudden loss of weight, persistent fatigue, night sweats, afternoon temperature and other well recognized signs of the dreaded disease, you can forget about it. It has nothing to do with tuberculosis, nor with silicosis, which it also closely resembles in appearance.

A weldor who has been working in a dense concentration of iron oxide fumes may receive a bad scare if he happens to spit and notes that the sputum is of a grey-black or a rusty color. The discoloration is probably produced by reddish-brown ferric oxide, not blood, as a chemical examination of the sputum will show. Once again it has nothing to do with tuberculosis.

Medicine has given the name "siderosis" to the lung condition due to the inhalation of iron particles. It seldom occurs unless a weldor has been working for many years at his trade. The average period of welding for the weldors whom Dr. Groh found with normal lungs was 6.7 years. It was 8.5 years for weldors with lungs of "slight nodulation" and 9.2 years for the advanced cases.

There is no evidence to suggest that even the extreme cases cause any physical disability or should lead a weldor to change his occupation. "All evidence to date," concludes Dr. Groh, "indicates that arc weldor's siderosis is not a hazard to the health of a workman." He believes, however, that it may have a serious effect upon the mental health of a weldor unless it is correctly diagnosed and explained in a manner to relieve the patient of worry.

Constituents of Fumes

Tebbens and Drinker investigated the composition of welding fumes and found that in mild-steel welding with all of the E-6000 series electrodes the fumes evolved contained about 60 to 70% of ferric oxide + titanium dioxide, from 10 to 30% silica and from 2 to 12% manganese dioxide. According to "Health of Arc Weldors in Steel Ship Construction," the U. S. Public Health Service bulletin earlier mentioned, an over-

all average of 1,765 fume samples collected showed that 50% of the total fume consisted of ferric oxide, about 15% titanium dioxide, 8% silica and 24% as a mixture of acid-soluble metals such as magnesium, calcium, aluminum, manganese, chromium, copper and sodium, each present only in small quantity.

When welding is done on galvanized material, report Drinker and Nelson, the total fumes increase with the introduction of some 65% zinc oxide and a corresponding drop in ferric oxide, titanium dioxide, manganese dioxide and silica. In welding with stainless-steel electrodes, say the same authorities, the total weight of fume is about the same as for mild-steel welding but the analysis is quite different. The following is given as typical of fumes from stainless steel: silica 5.8%, iron 17.6%, ferric oxide 16.1%, chromic oxide 8.3%, nitric oxide 2.3%, calcium oxide 9.7%, manganese dioxide 2.8%.

The fumes given off in welding are a mixture of both gases and finely divided metallic particles. The principal gases arising in the arc are: ozone, carbon dioxide, carbon monoxide, water vapor and certain oxides of nitrogen. There may also be small amounts of hydrogen, sulphur dioxide, chlorine and fluorine, none of which are in sufficient quantities to constitute a hazard.

Ozone, an allotropic form of oxygen with the chemical formula O_3, is 1½ times as dense as ordinary oxygen and has a peculiar "electrical" odor. It may be harmful if breathed in large quantities but is scarcely a problem in welding as it rapidly disintegrates after leaving the arc zone.

Carbon monoxide is not ordinarily found to any great extent as it oxidizes to the relatively harmless carbon dioxide upon reaching the air surrounding the immediate vicinity of the arc. It is not found in toxic amounts if there is sufficient oxygen for its complete oxidation. If welding is to be done for a long time in a confined and unventilated space, however, carbon monoxide might prove to be a grave danger.

Oxides of Nitrogen

The only gases which constitute anything like a real hazard to a weldor's health are the oxides of nitrogen: nitric oxide NO and nitrogen dioxide NO_2. Nitrogen, which forms nearly four-fifths by volume of the earth's atmosphere, is ordinarily inert but will combine with oxygen at high temperatures. Sufficiently high temperatures for this chemical union are produced by the oxyacetylene flame and, even more so, by the electric arc. One of the earliest processes for the fixation of nitrogen from the atmosphere, a process now obsolete, was to force air rapidly through a zone of high temperature in an electric arc furnace.

Under favorable conditions, states Elkins, air which has passed through an electric arc contains 1—2½% nitric oxide. This gas has certain toxic effects but it is not considered to be as dangerous as the nitrogen dioxide to which it oxidizes. Dr. Quinn notes that 43,200 gram-calories of heat are required to unite one molecule of nitrogen and one molecule of oxygen and that 13,900 gm-cal are liberated when two molecules of NO unite with two atoms of oxygen to produce two molecules of NO_2. The first reaction is obviously an uphill reaction, consuming energy and hence taking place only at high temperature, while the second one, liberating energy, will not take place until the nitric oxide has materially cooled.

The mixture is thus apt to become more irritant with time unless the NO is removed by ventilation before the nitrogen dioxide can form. "From the kinetics of nitric oxide oxidation," concludes Elkins, "it would be expected that the oxides of nitrogen in fumes from the electric arc would consist mainly of NO. Under very poor ventilation, however, NO_2 might predominate."

In heavy concentrations, the nitrous gases have been held responsible for inflammation of the lungs and upper respiratory tract, dilation of arteries, fall in blood pressure, vertigo, headache, pulmonary edema (weldor's pneumonia) and even death.

The evidence blaming NO_2 for pneumonia is not altogether convincing, according to Drinker and Nelson. Lieutenant Robert W. Quinn, Medical Corps, U. S. Naval Reserve, reports two cases of acute pulmonary edema, one of which necessitated the administration of oxygen for several hours. Nevertheless, pulmonary edema is comparatively rare; Dr. O. A. Sander stated that he had never heard of a single case in the Milwaukee district.

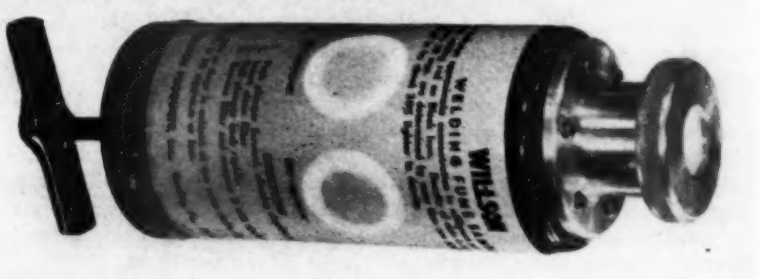
The alarmist of the medical authorities is probably Captain Howard K. Sessions, USN, who warns us:

"Nitrous gases are not the most toxic of the irritant gases, but they are among the most insidious. . . . Without much discomfort, it is possible to breathe air containing a lethal concentration of oxides of nitrogen."

These are gases that give little warning. The irritation felt in nose and throat is not proportionate to the inflammation of the lungs. Consequently, the ill effects may be delayed for several hours, allowing the lungs to fill with fluid.

The maximum allowable concentration of nitrous fumes is given by Sessions as from 10 to 40 parts per million parts of air (ppm). The range of 100 to 150 ppm is dangerous for short exposures—one half to an hour. Concentrations above 200 ppm may be fatal even on a short exposure.

In view of the above figures, what concentrations of nitrogen oxides are apt to be encountered in ordinary welding? The question is an important one, and our best guide so



FUME SAMPLER—if a faint stain or tinge is evident at one pump stroke, the fume concentration of iron oxide is 30 mg per cubic meter or less

far is the previously mentioned survey made by the U. S. Public Health Service in coöperation with the Maritime Commission and the Navy. A total of 2,019 fume samples were taken from seven shipyards to be tested for their concentrations of oxides of nitrogen. Of these, more than half contained less than 5 parts per million of nitrogen oxides and more than 80% of the samples contained less than 10 ppm. Only five shipyard samples (0.2%) exceeded the value of 40 ppm suggested as the maximum allowable concentration. Two of these were in the cargo holds of the hull, two on the top deck of the hull and one was in the pipe shop. The highest value encountered anywhere was 62 ppm.

Cook suggests 25 ppm as the maximum allowable concentration for nitrogen oxides. States the survey: "The highest proportion of samples exceeding 25 parts per million was 10.4% on the subassembly inner bottoms, followed by 5.8% on the top deck and outside shell of the hull and 4.5% in the pipe shop. The other subassemblies and shop locations had less than 1% in excess of 25 parts per million."

Ventilation Requirements

Nitrogen fumes do not appear to be any real hazard in shipyards, and it is unlikely that industrial plants would make a worse showing. No weldor need lose sleep over them, but management should make sure that the plant ventilation is adequate.

Let us now look at what some of our authorities say constitutes adequate ventilation. The Public Health survey specifies one air change every 1 to 4 minutes as a guide for all locations and recommends metal duct of approximately 18-in. diameter for the ventilation of ship holds.

Drinker and Nelson say: "In open shops it often is not necessary to use local exhausts. The general ventilation of the building may suffice. If production work is to be handled, such as pipe welding, it usually speeds up production to apply local exhausts with flexible hose. In ship construction, both general ventilation and local exhausts are used. As a guide, we recommend local exhausts drawing about 200 cfm per weldor with the exhaust hood placed within 8 in. of the work. Where general ventilation is the method used, we recommend at least 400 cfm per weldor."

"For ordinary factory work," asserts Stern, "exhaust alone will suffice since windows, doors and louvered wall openings can supply sufficient make-up air without excessive pressure drop. . . . Shipyard experience points to the value of using both supply and exhaust air to double bottoms and similar spaces rather than exhaust alone. The supply air should, of course, be taken from out-of-doors rather than from some other part of the ship."

In the opinion of Stern, general ventilation of spaces under 5,000 cu ft should not be left to natural ventilation even in part, but should have the entire ventilation load handled by fans. He recommends ventilation of the order of from 750 to 1,500 cfm per weldor for small spaces and for the interior of tanks and vats. With regard to local exhaust, it is preferable, he believes, to base all local exhaust for welding on the maintenance of an air velocity at the point of weld of 100 lineal feet per minute away from the breathing zone of the weldor and towards the hood, booth or enclosure provided.

A reasonable criterion for general room ventilation, according to Stern, is "to require not less than four air changes per hour, supplied either by natural ventilation, mechanical ventilation or both." He also cites the New Jersey Department of Labor Welding Protection Standards, which recommend that welding bays should not be structurally blocked, thereby obstructing cross ventilation, and that there should be provided either a space allowance of 15,000 cu ft per weldor or ventilation of at least 350 cfm per weldor.

If ventilation is adequate, the fumes are usually not visible or visible only with difficulty. If a dense smoke shows, weldors are apt to complain. As an index of air cleanliness, the U. S. Maritime Commission uses a threshold concentration of 30 milligrams of iron oxide fumes per cubic meter. This value is not too critical, but it is known that the air becomes cloudy and unpleasant to breath, visibility is poor and working conditions are unsatisfactory when iron oxide fumes exceed 30 mg per cu m.

Ege and Silverman invented a quick sampling device to determine fume concentrations by collecting the fumes on filter papers. The air-sampling unit was made from a converted foot-operated automobile tire pump. (A commercial model of this pump is now on the market.) When the fume samples are forced through the filter paper, reddish-brown stains of iron oxide appear. The concentration of the sample can be quickly ascertained by comparing it with standard stains corresponding to such values as 30, 60, 90, 120 and 150 mg per cu meter. As a practical rule for field work, the fume concentration is 30 mg per cu m or less if a faint tinge of stain is evident on the paper disc after a single pump stroke.

Coated vs. Uncoated Electrodes

No harmful gases have been found to be liberated from electrode coatings. Theoretically, say Drinker and Nelson, hydrofluoric acid could be evolved from the coating of stainless-steel electrodes. These investigators, however, burned a great many such electrodes in their gas cabinet and found no HF. Tebbens and Drinker declare that less nitrogen oxide is formed with coated than with uncoated electrodes since the shielding gases hinder contact of the high-temperature arc zone with the oxygen and nitrogen of the air.

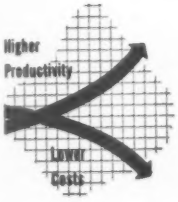
It will be remembered that typical fume analyses revealed the presence of from 8 to 30% silica. This, apparently, is not enough to create a hazard of silicosis—a respiratory disease resulting from the breathing of silica dust. Even though silicates are often used as binders for electrode coatings, numerous studies have failed to show any excessively high silica dust concentration.

In gas welding and cutting, states Schmidt, metal fumes form to a lesser degree than in arc welding. There is also a lesser degree of formation of nitrous fumes and ozone, but a higher degree of formation of carbon monoxide and of oxygen depletion of the surrounding air.

Part II of this article, to be published in the November issue of The Welding Engineer, will discuss the fumes arising from the welding of stainless steel and from the "toxic" metals—zinc, lead and cadmium.

REFERENCES: The complete list of authorities consulted, with the sources of their published papers, will be appended to the second installment of this article.

CLASSROOM INSTRUCTION is given informally to groups of about this size at a—



SCHOOL

for Preventive Maintenance

In five days of laboratory and classroom, the student who attends the Progressive Welder school learns how resistance welders are made and what's most likely to be the trouble when one goes wrong

BY WILLIAM C. HENZLIK

TO ADVANCE the welding art and also help lick today's most urgent problem of higher production at lower costs, Progressive Welder Co., Detroit, has started a school for preventive maintenance of resistance-welding equipment. Purpose of the five-day course is to lower "down-time" of resistance welders by teaching how a vigilant and never-ceasing maintenance program keeps a welder from getting down in the first place.

Whether a plant uses a single small spot welder or long rows of giant multiple welders, it can save money, reduce accidents, prevent worker lay-offs and carry on more efficient manufacturing operations if every welder is operating as designed every hour of the work day. So far it simply hasn't been possible to train men in all plants how to run and service these machines. Progressive is trying to remedy that situation.

STUDENT MET AT TRAIN

Attendance at the school is free to the student, whose only expenses are for his lodgings and food. From the moment he arrives in Detroit, he feels that the school welcomes his presence. Upon arrival, the out-of-town student is taken to the Fort Shelby hotel, where Progressive has made special accommodation arrangements. A map of the city showing the main thoroughfares, good eating places, entertainment spots and business centers is given to him when he registers to aid in making him feel at home.

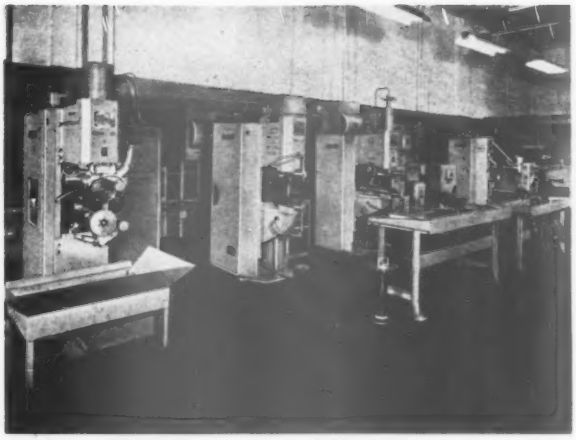
Station wagons are in front of the Shelby hotel every morning to carry the student to the Progressive plant. At the end of classes or examinations in the afternoon, he is also driven back to the hotel.

Before classes start, the visiting maintenance man is given a colossal notebook. It measures some 2½ in. thick and contains between its covers a schedule of classes and shop periods for the week, notebook paper, copies of the lectures to be presented, nine manuals on timers and electronic controls, two manuals on hydraulic equipment and recommended practices of the American Welding Society and Resistance Welder Manufacturers Association. Copies of the lectures are in the same words the instructors will use; the student is urged to read them over beforehand so that he can ask pertinent questions in class.

EXECUTIVE INSTRUCTORS

Men in the top management and operating levels of Progressive act as instructors in the school. Teachers from outside, without real interest in the school's long-term objectives, couldn't possibly attain the excellence and all-around experience that is now concentrated in the teaching staff.

Such men as J. R. Lex, director of engineering; William Plummer, gen-



LABORATORY equipment includes press-type spot and projection welders, a universal seam welder and other machines. Range in current is from 1,000 to 100,000 amp

300-KVA FLASH WELDER with dual heat and postheat controls operates on forces to 80,000 lb. On the right is a homopolar d-c generator with a 53,000-amp output

eral sales manager; Gordon H. Porath, works manager, and C. W. Kegg, personnel manager, are on the staff in supervisory, teaching or assisting capacities. Chief Electrical Engineer E. J. Zulinski conducts the sessions on electrical control and timers. Hydraulics in resistance welding is covered by R. L. Loup, chief hydraulic engineer. Joe Mase, manager of experimental and sample welding; Robert Barley, service manager; T. J. Crawford, consulting engineer, and R. W. Heiden, staff assistant, are other Progressive Welder engineers who double in brass on the teaching staff.

Everything Teacher Needs

Classes start on Monday morning in an air-conditioned and fluorescent-lighted classroom. Chairs are comfortable, mindful of the adage that the mind can only absorb what the seat can endure. All needed facilities for visual teaching—slide and movie projectors, blackboards, charts, diagrams, display boards and instruments—are provided for the pupils.

Our student visitor first hears a 45-minute introductory talk on the goals of the school and the history of resistance welding, given by Bill Plummer, general sales manager. Following Mr. Plummer's talk, a 30-minute sound film shows resistance welding on the job. After a rest period, the student and his fellows, usually numbering about a dozen, are taken on a half-hour tour of the shop to get them acquainted with the place where they will work.

Following the shop tour, a one-hour lecture reviews the various types and processes of resistance welding in use in modern industry. It's a full morning! The student, however, is off to a running start with what he will study and the equipment with which he will work. On Monday afternoon, Joe Mase makes half-hour demonstrations of rocker-arm, pedestal, press-type, seam and flash welding equipment as well as resistance brazing. The array of welders used in these demonstrations includes press-type spot welders, a projection welder, a seam welder, pedestal and rocker-arm spot welders, several motor-operated flash welders and portable welding guns. In spot and in projection welding equipment alone, the range of electrode force varies from 100 to 9,000 lb, while current ranges from 1,000 to 100,000 amp.

For testing purposes, a portable oscillograph and a Kelvin bridge are set up in the laboratory. Two large metallurgical cabinets are installed in the lab for holding weld samples and weld test material.

Since Progressive is one of the proponents of standardized and interchangeable welding equipment, large display boards are prominently placed around the classroom and laboratory to tell the advantages of having guns, hydraulic and air cylinders, valves and boosters that may be enlarged, decreased or changed in character by the substitution of various parts. In this manner, the job at hand may be accomplished merely by substituting spare parts instead of replacing expensive cylinders, etc.

Other types of equipment which are used in the interest of students during their stay at the school include electro-brazing and percussion-welding equipment and stud welders.

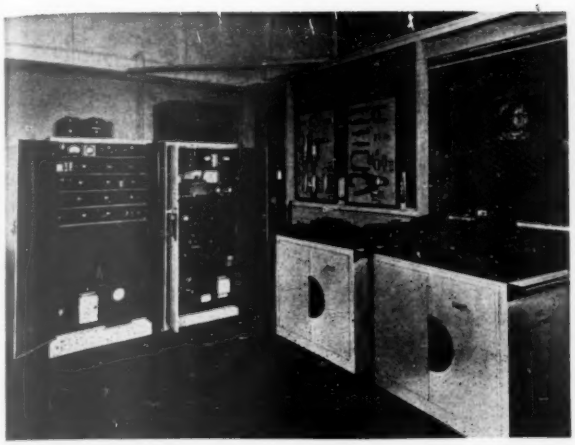
Instructor Mase shows the proper starting operations, typical settings for the controls, how to check all connections for proper operation and the range of materials that may be welded. Students interested in a particular process, say seam welding, are invited to weld small test pieces of various metals.

Controls and Timers

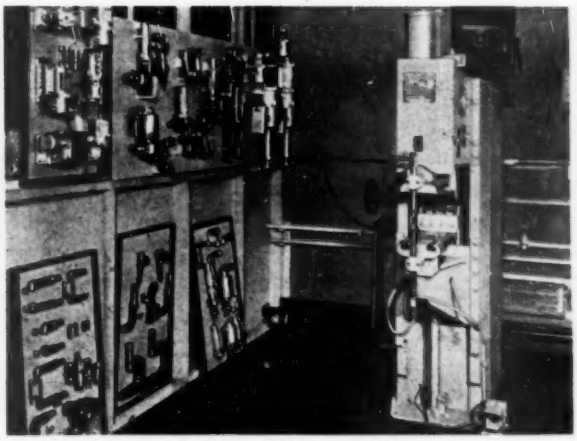
On Tuesday morning starts one of the most valuable sessions in the school, according to former students. Eddie Zulinski, the company's chief electrical engineer, gives a clear and practical lecture on the electrical components, controls and circuits of resistance welders.

The instruction on electrical controls and timers takes all day Tuesday and Wednesday morning. Timer operation is emphasized, but such subjects as electronic tubes, tube contactors, heat controls, trouble shooting, transformers and power lines receive close attention. Progressive feels that many of the reasons for welder shutdown or uncertainty of functioning may lie in this particular field.

Laboratory periods are utilized by Mr. Zulinski to show the various timers and controls to his students. Complete impartiality is maintained towards all makes of equipment, and



PORTABLE OSCILLOGRAPH and a Kelvin bridge (cage at right) aid in solution of production problems. Lab also contains metallurgical and instrument cabinets



PANELS OF PARTS for welding guns, cylinders, valves and boosters enable the student to see for himself how standardized assemblies can be made up for a given job

the advantages and disadvantages of particular models are explained.

Synchronous and non-synchronous panels, both with postheat, and a synchronous control with preheat in a 1-500 cycle range are in the shop.

Though it is helpful for a student to have a knowledge of electrical theory in order to follow the lectures, it is possible for those without formal theoretical knowledge to pick up many practical ideas.

Hydraulic Equipment

The lectures on hydraulic equipment in resistance welding are presented by Instructor Ron Loup, chief hydraulic engineer for Progressive, on Wednesday afternoon. Component parts and unit assembly systems are discussed first. Films show the parts in actual operation. A laboratory period demonstrates the functions of the hydraulic components described in the lecture room. To close the day, trouble-shooting and maintenance problems for hydraulic equipment are reviewed.

Several manuals from leading suppliers of hydraulic equipment are included in the large notebook that is given to all students. Students may ask questions about these manuals and also take them back home to use as guides to their own work.

Electrode maintenance, cooling and air systems, and a laboratory period on electrodes and dies are all scheduled for Thursday morning under the leadership of Bob Barley, service manager. Again, service manuals and instruction sheets sent out by suppliers of such equipment are utilized to point out specific care for each type of accessory. Practices that are recommended by Progressive, the American Welding Society and the Resistance Welder Manufacturers Association are incorporated into the lessons.

On Thursday afternoon, clamps, fixtures, lubrication, bearings, bushings, installation and similar problems are discussed by Mr. Barley. A laboratory period and examination close the day.

Design for Maintenance

Joe Lex, director of engineering of Progressive, talks to the students on Friday about the desirability of designing resistance-welding machines for easy maintenance. So often, he points out, the use of a little foresight on the part of a manufacturer will mean hundreds of hours and thousands of dollars saved over the years to the purchaser who uses the equipment. Accessibility to piping systems, locks on certain equipment to prevent unauthorized adjustments . . . these are typical examples of what the manufacturer can build into the machine.

Written examinations of each day's study are held daily, and a "final" for the entire course is given Friday afternoon. A "graduation" dinner is generally held at the Fort Shelby hotel on Friday night at the conclusion of the week's classwork. After careful grading during the following week, Diplomas of Achievement are awarded to students who have successfully passed all tests. The student's grades for the course are sent to his employer, who thus has the opportunity to judge the results for himself.

Instructors Praised

Competence of the instructors was praised by one ex-student interviewed. He works in a research laboratory of a large machinery manufacturing plant. "They not only know the material presented—they can tell it to other people," was his comment. This is worthy praise on the school's excellence when one considers how many technically competent men just can't talk about their specialty in understandable terms.

The stress on timers is a wise measure, this same student reported. Zulinski's presentation was one of the clearest and best guides to an understanding of the proper setting and maintenance of all types of timers that he had ever heard.

Impartiality as to the qualities of various makes of equipment was also noted by the same student. He likes the fact that operating manuals from different companies were used in shop periods and that no attempt was made to sell him on any particular machine.

Studies of the methods and equipment used in the Progressive school may at some time be a guide to a proposed school in his own company to train resistance weldors from branch plants, the student concluded, adding that he could hardly hope to find a better model.

PORTABLE GUNS and two more flash welders are found along the south wall. Gun installations vary from 100 to 750 lb force, range in current from 3,000 to 20,000 amp. Other welders can be operated up to 400 welds per minute

Though he was already familiar with the general operation of resistance welders, another student recalled that the review presented by the Progressive school had brought him up to date on new improvements and new techniques which he otherwise would have missed or learned about much more slowly. This student, who works in a large metal-fabricating plant in Chicago, was mainly concerned with the flash-welding process and was extremely interested in the experimental laboratory work on heat controls, etc., for flash welders.

Wants Special Courses

Only criticism which this man had to offer was that all the students received the same course on all types of equipment. It would be desirable, he thought, if those students specially concerned with spot welding or flash welding, for example, could be grouped together for concentrated shop work or specialized lectures.

Since so much material is covered in the five days, the possibility of future postgraduate sessions of the school are looked forward to by this man as an opportunity to clear up certain questions left unanswered.

The amount of coöperation everywhere evident in the plant was praised by a student attending the school from a large tractor works in Chicago. "Being able to approach any man in the organization with a question about assembly of a part, design of a component or operation of a circuit is one of the most helpful and stimulating privileges a student can have," he says.

It should be noted that coöperation at the plant by all personnel, connected with the school or not, is regarded by Progressive as a real aid to understanding resistance welding. Every pupil is free to ask questions of the workers assembling welders or research men in the laboratories as well as instructors in the shop sessions. Certain components that might appear confusing in diagram appear more simple as each part is installed, tested or disassembled.

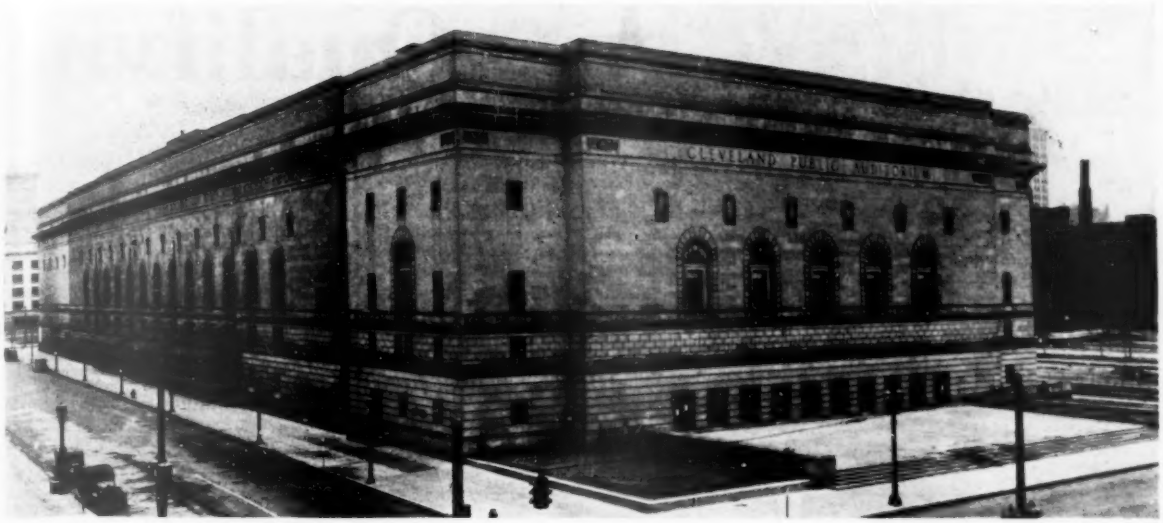
One student found the notes taken in his large notebook and the printed manuals given to him were constantly useful after his return from Detroit. The information represented would otherwise have to be compiled from many sources and even then would not have the coherence of the school presentation, he said.

The convenience of free transportation to and from the school was much appreciated by the last student interviewed. "Just one of the many things they do to help us get the most out of the course," he says.

Looking Ahead

Possibility of advanced courses is partially dependent upon the continued response of the students to the first course on preventive maintenance. Specialized training in several of the phases of resistance welding that were only hurriedly touched upon in the first course could well be discussed and probed in further detail. That's for the future, however.

Because Progressive feels that sooner or later resistance welding will play an important part in the design or redesign of most products for highest efficiency and production, its management is contemplating a "design for resistance welding" course. This would deal with the fundamentals of sheet-metal product design and fabrication, with emphasis on the quality, high production and low unit cost obtainable when products are specifically designed to be resistance welded.



PUBLIC AUDITORIUM, Cleveland, provides conference rooms and 250,000 square feet of exhibit space for the—

Metal Show

31st National Metal Congress and Exposition, to be staged October 17 to 21 under sponsorship of four organizations, will feature "Economy in Production"

BY WALTER MORRISON

"ECONOMY in Production" will be the theme song of the 31st National Metal Congress and Exposition, being held at the public auditorium, Cleveland, October 17-21, under the joint sponsorship of the American Society for Metals, American Welding Society, Metals Branch of the American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing.

SOME 350 EXHIBITORS

Approximately 350 nationally known firms engaged in either the production of metals, the treatment of metals, the fabrication of metals or in rendering services to metals industries will exhibit their products, and equipment in Cleveland's huge public auditorium. Over 200,000 square feet of floor space has already been assigned to companies who will participate in the big five-day event. Many additional smaller auditoriums, meeting rooms, motion picture theatres, dining and banquet halls have also been reserved for technical discussions and special events.

Among special features scheduled for the Cleveland Metal Show are roundtable discussions on the "Economy in Production" theme. Eight such roundtable sessions will be held, Monday through Friday. Another feature will be the "Economy Theatres" in the many exhibit halls in the auditorium. These will enable exhibitors having motion pictures to show such films to responsive and interested audiences. During the week, schedules of the motion pictures to be shown will be regularly published.

SEMINAR SESSIONS

Seminar sessions on "Thermodynamics in Physical Metallurgy" will be held in Cleveland on Saturday and Sunday prior to the Metal Show itself. They are scheduled for morning, afternoon and evening on Saturday, Oct. 15, and morning and afternoon on Sunday, Oct. 16. These technical seminars are sponsored by the American Society for Metals and will be held at the Hotel Statler.

Educational lecture courses, technical programs and other special meetings by the sponsoring societies will be held on each day during the period of October 17-21. The ASM Metallographic display will be a permanent exhibit during the week of the Metal Show.

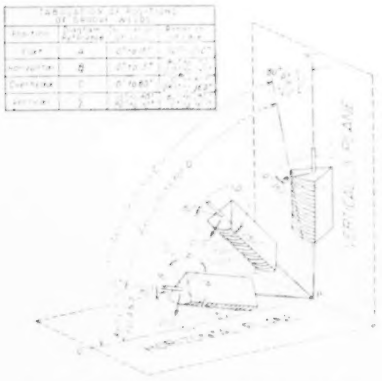
The four sponsoring societies, through their scheduled seminars, lecture sessions and meetings on technical subjects pertaining to metals production, treating and processing, will provide show visitors with daily opportunity to hear vital technical subjects discussed and analyzed by some of the country's leading engineers and teachers. The American Society for Metals and the American Welding Society (see page 43) will hold morning, afternoon and evening sessions throughout the week. The Metals Branch of the American Institute of Mining and Metallurgical Engineers will have daily and evening sessions Monday through Wednesday. The Society for Non-Destructive Testing has scheduled morning and afternoon technical sessions on Wednesday and Thursday.

Managing director of the 31st National Metal Congress and Exposition is W. H. Eisenman. Assistant director and floor manager is Chester L. Wells. Headquarters are at 7301 Euclid Avenue, Cleveland 3.

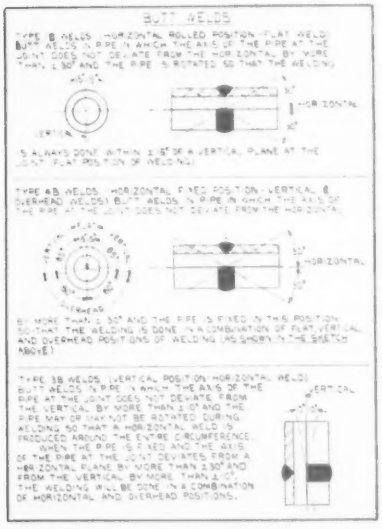
Qualifying P

Do you know the differences between the establishment of a welding procedure, the qualification of a procedure and the qualification of welding operators? If you aren't quite sure, read this article

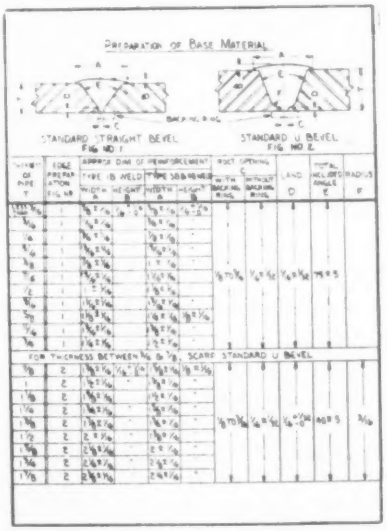
BY ERIC R. SEABLOOM
Field Research Engineer, Crane Co.



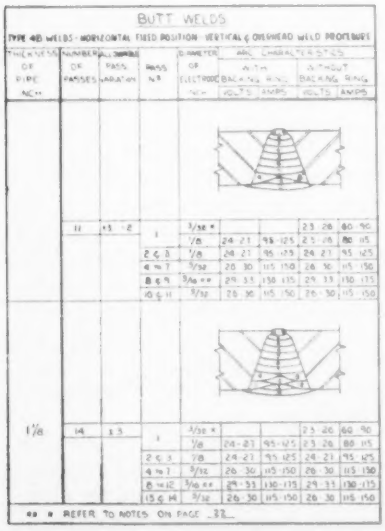
1—WELD POSITIONS have to be described in a procedure specification, as illustrated by sketch

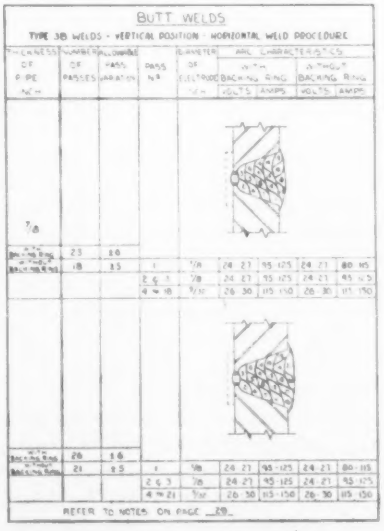


2—PIPE POSITIONS should be indicated as horizontal rolled (downhand), horizontal fixed and vertical



3—EDGE PREPARATION must be included. Above data sheet gives preparation for any pipe thickness





4—ARC CHARACTERISTICS, electrode sizes, etc. are given in these two typical sheets for pipe welds in horizontal fixed and vertical positions

VARIOUS codes governing welding incorporate rules for procedure and operator qualifications. These are all quite similar in character, but, to judge from repeated questions asked the writer, perhaps they are not fully understood by persons entering into welded construction such as boilers, pressure vessels and piping for which these regulations are mandatory.

As an aid to those who are concerned with such weldments, it is the intent of this article to offer a practical review on the subject of establishment of welding procedures, tests required to qualify procedures and the qualifications of welding operators. In order to be specific, Section IX of the ASME Boiler Code has been selected as an example since it has jurisdictional standing in many states and cities within the United States as well as provinces of Canada. The National Board of Boiler and Pressure Vessel Inspectors is the enforcing body in political subdivisions which have adopted this code. Insurance underwriters also require the adherence to the regulations in welded construction of pressure-containing equipment.

What the Rules Say

The rules in Section IX of the ASME code are based on the recommendations prescribed by the American Welding Society's "Standard Qualification Procedure." These are intended to apply to manual arc and gas welding of ferrous materials which in their unwelded state are sufficiently ductile to meet the requirements of the guided-bend test. The code assumes that the fabricator or contractor has an organization familiar with the various welding regulations and capable of designing, engineering and supervising welded construction. Such organizations shall be responsible for the quality of welding done and conduct tests on their

Procedures and Weldors*

prescribed welding procedures to show that the combination of process, material and technique produces welds of the desired strength, ductility and soundness to meet code requirements. These procedures then become the welding specifications. They must be followed in making weldments on materials within ranges given in the code to provide a means of assuring reproducible results or quality control. In addition, the welding operators must pass qualification tests to determine their ability to apply specific welding techniques.

To simplify this review, the steps necessary to establish a welding procedure and qualify a procedure and weldors will be confined to the metal-arc welding of single butt joints. The necessary tests required to prove that strong, ductile and sound welds result from such controls will be described. References to codes, standards and specifications giving more detailed information on the subject are appended.

Requirements of a Procedure

In drawing up a procedure specification for the welding of steel plate or pipe, the fabricator or erection contractor can be guided by his present practice on well established materials such as mild carbon steels, providing experience has demonstrated that the weldments will be acceptable. In dealing with new alloys, however, it is advisable to conduct preliminary tests and obtain all pertinent data before a procedure is drawn up.

The written specifications must cover the following topics, to be described and/or illustrated.

Process: State the welding process to be employed. As mentioned previously, this article will deal only with metal-arc welding.

Base Metal: Specify the base materials involved in the construction of a boiler, pressure vessel or piping system by referring to ASTM or other code designations. In the absence of such designations, describe the chemical composition and physical properties.

Filler Metal: Name the applicable ASTM designation and electrode classifications that preferably match the base metal requirements. Three ASTM Specifications cover arc-welding electrodes; namely, A233-48T for mild steels, A316-48T for low-alloy steels and A298-48T for corrosion-resisting chromium and chromium-nickel steels. ASTM A233-48T and A316-48T include a number of electrode classifications based on tensile strength of the deposited metal, type of coating and usability characteristics of the electrodes. Neither of the latter two specifications require any limitations on the chemical composition, whereas ASTM A298-48T includes the chemistry in addition to physical properties, coating and usability. Consequently, the user who deals with low-alloy materials must select the electrode classification and brand names which best meet the physical and chemical requirements. Such information may be obtained from the electrode producers or by experimental tests. In most cases, it is advisable to consult with the suppliers and also conduct tests before the final selection of electrodes is made. In addition to the electrode classification, it may be advisable to incorporate the trade designation in the procedure as a means of assuring correct chemical analyses on low-alloy steels.

Positions of Welding: Describe the positions in which welding will be done. The description may be amplified by sketches, as illustrated in Fig. 1, giving the limitations of flat, horizontal, overhead and vertical positions. In the case of pipe, the positions should be indicated as horizontal rolled, vertical and horizontal fixed (see Fig. 2).

Preparation of Base Metals: A data sheet similar to Fig. 3 should be included in the specification to show the shape of the welding grooves, land thickness and root spacing for the different thicknesses involved. A word description should also be given of the methods of forming the welding scarfs—shearing, planing, machining, flame-cutting, or grinding—including cleaning prior to welding.

5—GUIDED-BEND test jig for producing root, face and side bend specimens in accordance with code

Nature of Electric Current: State whether the current is alternating or direct. If the latter, specify the polarity; that is, straight or reverse (base metal on positive or negative side of the line). Polarity will depend upon the electrodes selected.

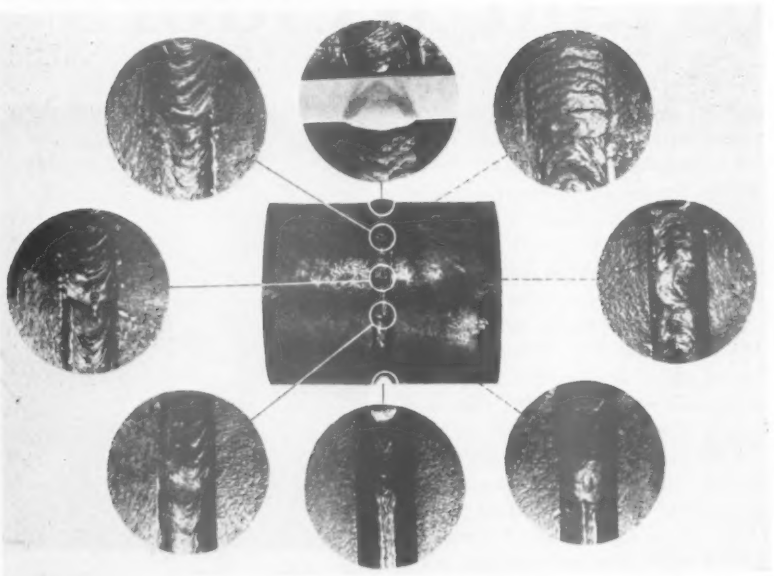
Welding Technique: The electrode sizes, arc voltage, amperage range, number of passes for each thickness and the welding technique (weaving or beading) to be used should be shown on sketches, as illustrated by the typical examples in Fig. 4. These factors will vary with the various positions of welding.

In the welding of many materials (particularly mild carbon steels) in the flat or horizontal rolled position, proper welding heat can be determined by the appearance of the individual passes of welding. Hence the use of a "standard appearance weld" may be desirable. Such a weld can be made in plate or pipe and should show approximately 2 in. of the surface of each layer with cross-section through the weld layers as in Fig. 6, a butt weld in 8-in. steel pipe. When an appearance standard is used, reference to voltage and current values can be eliminated, with the substitution of the following paragraph:

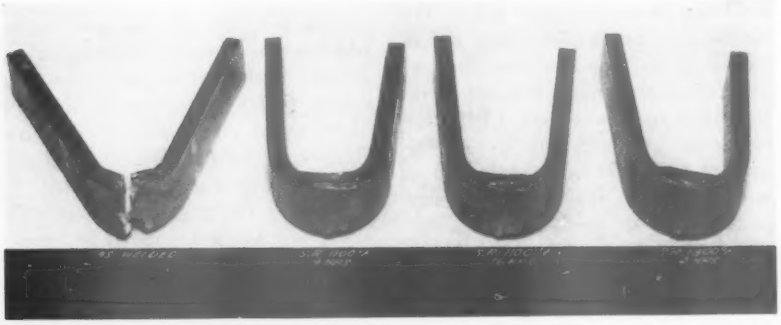
Appearance of Welding Layers:

*Abstract of a talk presented at the 19th general meeting of the National Board of Boiler and Pressure Vessel Inspectors, Chicago, May 18, 1949.

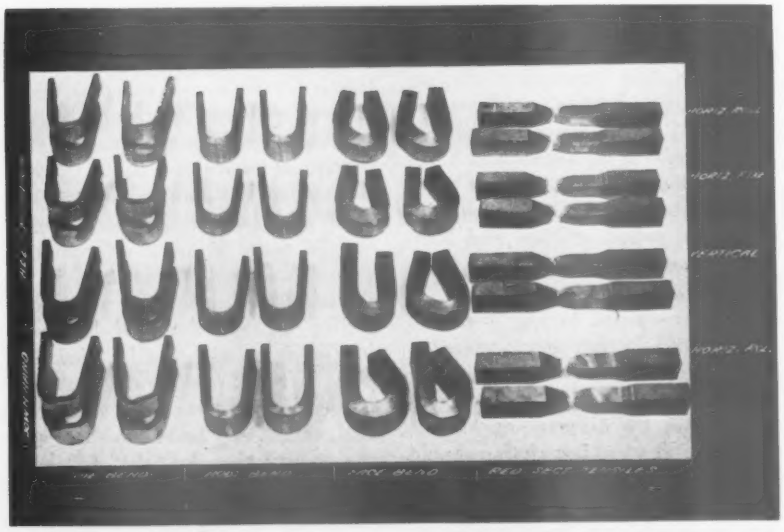
Test Methods



6—APPEARANCE STANDARD, 8-in. pipe welded in horizontal rolled position



7—STRESS RELIEVING to secure ductility. The four samples indicate the effects of stress relieving at the times and temperatures specified



8—TEST SPECIMENS for procedure qualification tests. Simplified but similar tests qualify operators for welding under the particular procedure

The welding current and manner of depositing the weld metal shall be such that the layers will have the appearance shown on photographs attached. There shall be practically no undercutting on the side walls of the welding groove or the adjoining base material.

Cleaning: Set forth the means of cleaning all slag and spatter remaining on any bead of welding before the next successive bead is laid down. Cleaning may be accomplished by means of a hand peening tool, a light pneumatic slag remover or a power-driven rotary wire brush.

Defects: Describe the method of removing cracks, voids or other defects on the surface of a bead so that full penetration may be obtained with the next bead. Such methods of removal may include chipping, grinding or flame-gouging.

Peening: If peening is to be done, include a description of the degree of peening in the specification. Ordinarily, peening is not employed to any great extent except, possibly, on heavy-thickness material or when welding under restrained conditions. Properly exercised, peening relieves a portion of the shrinkage stresses, but there is always a danger of overpeening with resultant cracks.

Treatment of Underside: If the technique in making single butt welds does not provide for full root fusion without a backing ring, the method of preparing the underside for welding should be described. The previously deposited root layer can be machined or ground out to permit complete penetration of a welding bead on the underside. Another method is to "burn through" the root layer and grind away the excess weld metal.

Preheating: In the event that preheating is required, a description of this operation should be incorporated. The necessity of preheating and the temperatures involved will depend upon the steels and thicknesses to be welded. Preheating is employed to retard the cooling rate and thus prevent cracking of the weld metal by rapid quenching.

Generally, carbon steels do not need preheat. If the carbon content exceeds 0.35%, however, preheating at 400 F is advisable. When heavy sections of lower carbon material or when low atmospheric temperatures are encountered, consideration should be given to some de-

gree of preheat to prevent rapid quenching by the heavy or cold base metals. Most alloy steels are preheated from 400 F to 600 F or even higher, depending upon the carbon and alloy contents, cooling characteristics and air-hardening properties.

Heat Treatment: Heat treatment or stress relieving (the latter is sometimes called postheating or drawing) to be performed on the weldments should be specified as to methods and temperatures. This is related to the nature of the fabrication, materials involved and the applicable code requirements to be met.

Heat treatments such as annealing, normalizing and drawing, or drawing are usually performed on complete units in a furnace, whereas stress relief can be either a furnace or a local operation. Local stress relieving can be accomplished by gas burners, clamp-on gas-fired furnaces, electric induction coils or resistance coils. The most popular mode of heat treatment on ferritic steels is stress relief at temperatures below the lower critical transformation points of each steel. Carbon steel is usually heated to 1,100 F, carbon-molybdenum steel to 1,200 F and the low chromium-molybdenum alloys to 1,300 F to 1,350 F. Fig. 7 illustrates in a simple way the effects of stress relief to secure ductility. The necessity and type of heat treatment for stainless steels will depend upon the chemical composition, corrosive media and temperature to which the weldments will be exposed in service.

Weld Test Specimens

Procedure Qualifications: The welding technique prescribed in the procedure specification shall be followed in making the test welds. The code also stipulates the test plates or pipe, the number and dimensions of specimens to be prepared, test methods and test result requirements. In the case of butt welds in plate or pipe up to and including 3/4 in. thickness, one test weld for each position need be made only in 3/8 in. thick material. From these, two each of reduced-section tensile, free-bend, root-bend and face-bend specimens are machined. If the weldments involved are over 3/4 in. thick, then the test welds shall be made in the maximum thickness used in construction but need not be heavier than 1 in. In this instance, two reduced-section tensile, two free-bend and four side-bend test bars are required. It will be observed that in the latter case no root bends are necessary. Some fabricators prefer to include root bends since a check on proper root fusion is considered important.

The reduced-section tensile bars are subjected to tension loading in a testing machine until failure occurs. The tensile strength displayed by the specimens must not be less than 100% of the minimum specified tensile range of the base material used, excepting for slight modifications on U-69 and U-70 vessels.

Free-bend specimens are scribed with gauge lines on the face of the weld and prebent in a guided-bend test jig or in a vise. Further compressive forces are then applied, either in a testing machine or vise, until the bars are bent double or until a defect exceeding 1/16 in. in any direction appears on the convex weld face. The distance between the gauge lines is measured by a flexible scale and divided by the initial gauge length multiplied by 100 to obtain the percentage of elongation. The elongation percentage represents ductility of the weld metal; it should not be less than 30% for stress-relieved welds nor less than 25% for non-stress-relieved welds. Again, the requirements of U-69 and U-70 vessels are somewhat less.

Root, face and side bend bars are bent in a guided-bend test jig prescribed by the code. The specimens are placed and bent to conform to the U-shaped member of the jig (Fig. 5) so as to produce high bending stresses at the root, face and side faces of the welds and adjacent areas. This test indicates soundness and thoroughness of fusion. After complete bending, any cracks or other defects exceeding 1/8 in. in any direction and appearing on the convex surface of the bars shall be considered failures (disregarding cracks at corners). If a specimen has cracked or fractured, it may be broken apart and the fractured surface examined. In the event that it shows complete penetration throughout the entire cross-section, the cracked specimen shall be considered as acceptable if gas pockets and slag inclusions do not exceed 1/16 in. in the greatest dimensions and the sum of these does not exceed 3/8 in. per sq in. of weld metal.

Records of the procedure qualification tests must be kept by the fabricator or contractor and should be available to those authorized to examine them. Fig. 8 illustrates the results of typical procedure qualification tests described.

Operator Qualification

The test requirements for qualifying a welding operator are very similar to the procedure qualification. They are simplified, however, in that the tensile and free-bend bars are eliminated and only root, face or side-bend specimens are employed. The test welds are primarily intended to demonstrate an operator's ability to produce sound welds; the welding technique may or may not conform in every detail to the procedure specification. The code permits the elimination of certain test welds if the operator can qualify on a more difficult type. For instance, only root and face bend bars are necessary on 3/8 in. material, which qualifies an operator for thicknesses up to and including 3/4 in. Side bend bars only are required for material above 3/4 in. (maximum test weld need not exceed 1 in. thick), qualifying the weldor for all thicknesses. Here, again, some fabricators include root bend bars to ascertain the weldor's skill in securing proper root fusion, which is generally considered the most difficult to attain. The bars are bent in the guided-bend test jig and judged as previously described.

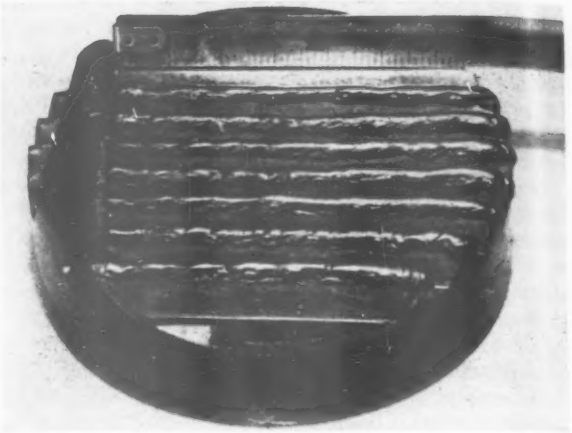
If a weldor fails to meet the requirements, retests are allowed. The operator qualification tests remain in effect indefinitely unless the weldor has not been engaged in a given process for more than three months or there is reason to question his ability.

Copies of weldors' qualification tests must be kept by the fabricator on data sheet forms and made available to those authorized to examine them.

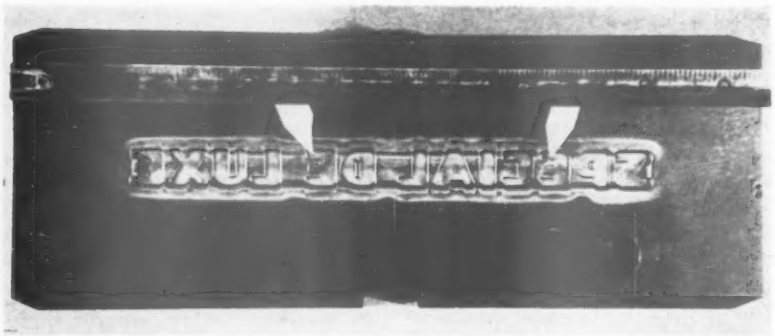
The National Board of Boiler and Pressure Vessel Inspectors has issued a bulletin entitled "Recommended Rules for Repairs by Fusion Welding to Power Boilers and Unfired Pressure Vessels." These rules distinguish between a qualified welding operator, who has met the requirements of Section IX of the ASME

(Continued on page 74)

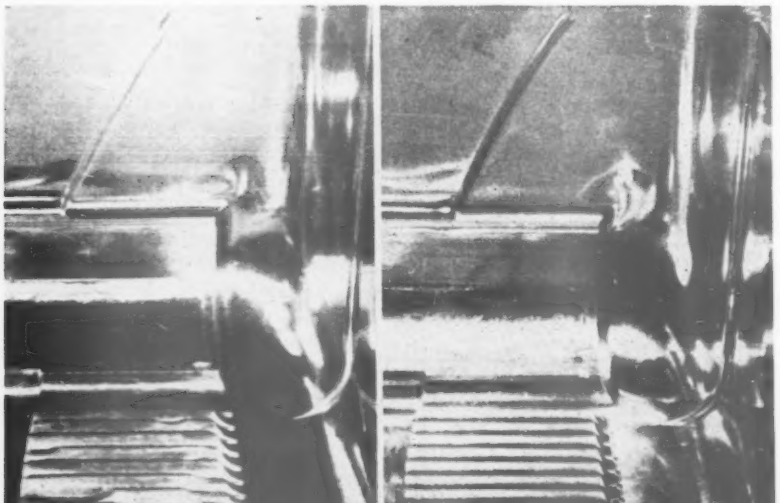
1—SHOP EQUIPMENT includes arc welders, atomic-hydrogen welders, oxyacetylene equipment, firebricks to build preheat furnaces and portable power tools



2—PRECISION WELDING repairs circular die for plastic radio cabinet. After machining, these ridges will press out the louvers that cool the radio tubes



5—MIDDLE BAR of letter "E" was broken off in a die for automobile nameplate. Atomic-hydrogen torch was used to deposit bead ⅛ in. square



6—BROKEN LOUVERS in radio cabinet die at left. The picture at right shows the same edges after build-up by Weldkraft to precision dimensions

Dies Can B

BY WALTER A. KNOCKE
Co-owner of Weldkraft, Inc.

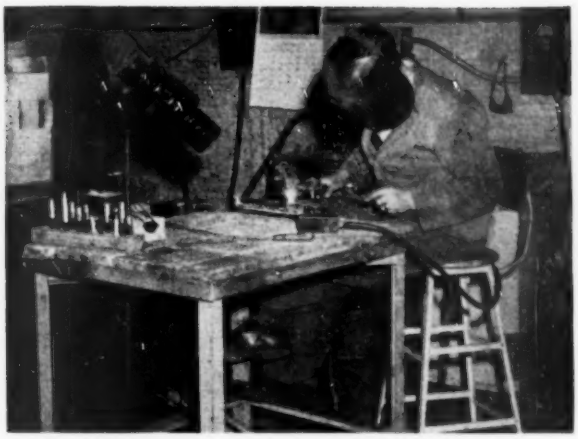
MAKERS and users of dies have wished for many years for an accurate "putting-on" tool. All concerned agree that large savings in tool and die costs are possible if a reliable welding source is available to add new metal to dies.

Weldkraft, Inc., Chicago, was organized in February, 1947, to render such a reliable service. Personnel of the shop consists of highly skilled weldors under the technical supervision of a welding engineer with many years of metallurgical and die experience.

The firm has a record of 99% success in die welding. Considering that tool steels are not always readily welded and that many dies are overstressed in service to the fatigue point, this record is a proud one.

Co-owners of the concern are myself and Herbert L. Salberg. I am a registered professional engineer with 20 years experience with various welding processes, welding schools and large-scale welding setups. Before forming Weldkraft, I was employed as works manager of Kelly Steel Works, Inc., a steel fabricating shop in Chicago.

3—COMBINATION BLANKING and drawing die fabricated by one of the skilled weldors at Weldkraft. Two kinds of metal compose the inside and outside surfaces



4—SPOTLIGHT built at Weldkraft provides high-intensity illumination of tiny die parts. It was made from photoflood lamp and soldered jacket of scrap tin

Be Precision Welded

Die weldors are like concert pianists—they must practice for many hours every day to be able to retain their special skill. Only in a shop that does nothing but die welding is such practice possible

Mr. Salberg was formerly a die-welding foreman and brought to the new company exceptional skill in handling the atomic-hydrogen arc torch. The three other men in the shop are specialists in either atomic-hydrogen, arc or gas welding and have better than average skill with the other welding processes. The skill of its men constitutes a major part of the service Weldkraft has to offer.

Weld-Records on Cards

When a die is brought into Weldkraft for repair or alteration, the first thing done is to make out a procedure card. The card has spaces for the customer's name, the die number, the kind of steel, its present hardness and the hardness desired in the weld. In addition, a small freehand sketch is made to show the extent and location of the contemplated weld.

From this information, the welding procedure to be used is determined. A description is then written on the card for one of the shop weldors to follow; his instructions specify the electrode or filler rod to be used, the welding process, preheat and postheat temperatures and any other pertinent information.

The weldor's assigned number is also written on the record card, fixing the responsibility for each job. Should further work be required on the same or a similar die, the card will tell which operator worked on the particular job when it was in the shop before. Space is also provided on the card for the weldor to write down any difficulties he experienced in doing the work. Hence any trial-and-error procedures worked out on the first job need not be repeated on the second, nor must time be taken to repeat special analysis.

All Types of Tool Steels

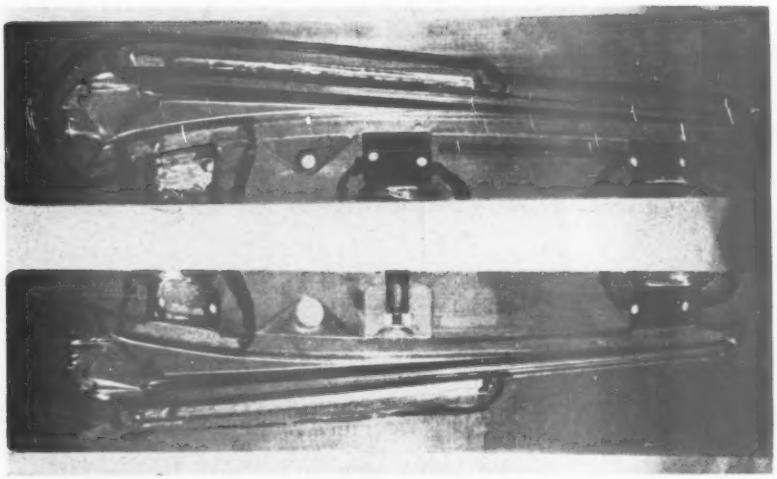
Using the latest welding methods and equipment, routine operations at Weldkraft now include the welding of all types of tool steel from the water-hardening grades through the air-hardening, high-carbon, high-chrome and high-speed grades. One rule closely followed is to match the filler metal to that used in the original die block. This is important because it allows the part to be annealed and reheat-treated with uniform hardness should such an operation be necessary.

A large stock of all types of electrodes and filler rods is kept on hand for matching purposes. To weld special-analysis steels, copper, brasses, etc., it is sometimes necessary to get rod or bar stock from a supply house and then cut or grind it down to usable size.

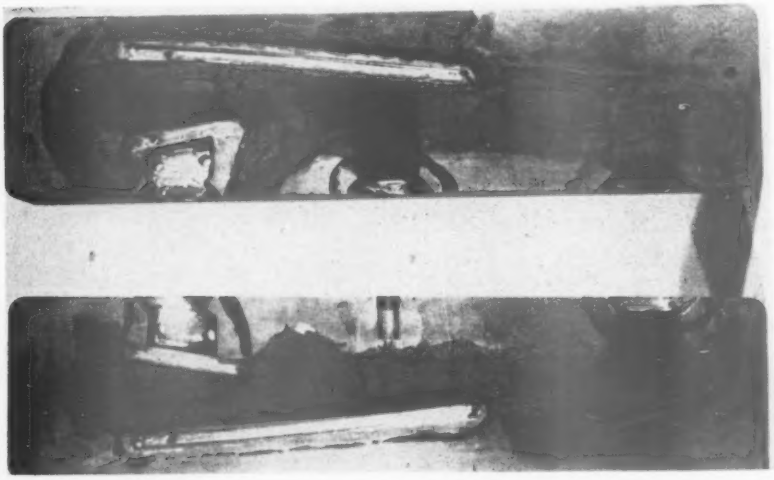
Various Types of Repair

Using the right combination of preheat and postheat temperature, the weld can be brought to the proper service hardness and finished by grinding. If machining is required for finishing, the problem is more difficult as the weld must be soft enough to machine yet hardenable. To obtain the desired hardness after machining necessitates annealing and reheat-treating. By metallurgically matching the tool steel, subsequent heat-treating will produce a uniform hardness in the repaired or remodeled die.

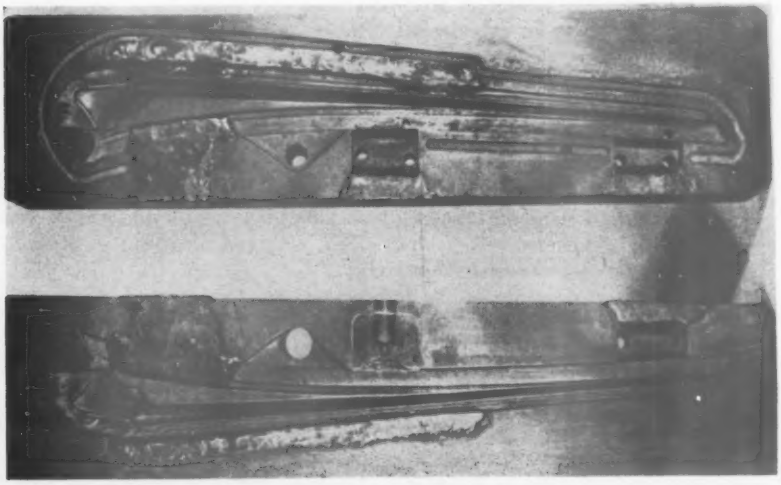
Weldkraft's services are used by every type of industry in the Chicago area. This necessitates considerable work in both repair and remodeling of stamping, blanking and forming dies. Usual repair on a blanking die is to replace the metal in a chipped or cracked cutting edge. The customer ordinarily specifies



7—DARK LINES show the area to be built up or repaired on dies for an automobile hood ornament. Build-up changed the dies to the 1949 style



8—CARBON PASTE and antispatter compound have been applied to the faces of the two die halves. Carbon confines the heat to the welding areas



9—AS-WELDED Indian headdress and mounting projections are shown before machining. Weldkraft does no finishing, lets customer handle that end

that the weld be hard and that no nicks or soft spots appear adjacent to the weld ends. Weldkraft is able to do this job with a hardness variation of plus or minus two points Rockwell C.

In remodeling operations, similar conditions are usually imposed. Where extensive changes are made, the die is sometimes annealed to make machining easier. A frequent job is to build up the most highly stressed radii of a drawing die. This can be done with steel of the same analysis as the original die, but it is possible to apply a dissimilar metal which will have superior wearing qualities for the particular service required. In this way, the life of a die can be extended indefinitely, and each renewal costs only a few percent of the cost of a new die.

Die-Casting and Plastics

Forging and die-casting dies are another source of business for Weldkraft. The replacement of worn or "washed out" corners is a daily occurrence as is the building of new sections for model changes. The simple closing of runners and flash pans makes possible greatly improved production from dies which had these features improperly cut. On many of the more complicated die-casting and plastic molds, it is rather difficult to get optimum gate and runner conditions without a trial. The former method of using inserts left marks on the finished piece, which sometimes were objectionable.

Plastic dies and molds are quite expensive, often having a value of thousands of dollars each. Small defects in them show up very plainly in the finished plastic product, and they must, therefore, be kept at peak condition.

The field of repair to plastic dies requires the finest skill from the weldor. Even the slightest porosity or undercut will cause rejection. The most painstaking work of all is performed on the molds for transparent plastic shapes such as radio and television dials and covers for television tubes. Such dials must be cast of near-optical quality, as any slight deviation of contour results in a distorted transmission of light.

Some repairs to this type of die are so delicate and trying that only

(Continued on page 72)

Where WeldOlet is attached to run pipe, it tapers at proper angles, providing for a single bevel groove joint at the crotch section, blending into a V-butt joint at the ear portion.
10" X 10" PATENT 1966.103
BONNEY WELDOLET MADE IN U.S.A.

The quickest — most economical — way to insure FULL PIPE STRENGTH AT BRANCH CONNECTIONS

WeldOlets*, with outlet sizes from ⅛" to 24", both straight and reducing, need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1b-1947. WeldOlet welding fittings provide the quickest, most economical, most *satisfactory* method of obtaining *full pipe strength* at branch connections. For detailed engineering reference data, write for Catalog W-2.

BONNEY FORGE & TOOL WORKS

FORGED FITTINGS DIVISION • 354 GREEN STREET • ALLENTOWN, PENNA.

Authorized Canadian Factory Representatives: Sterling Steel Co., Ltd., 20 Temperance St., Toronto 1, Canada—1040 Sherbrook St., W., Montreal, Canada

MANUFACTURERS OF FAMOUS BONNEY TOOLS

Fig. 1—Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets* eliminate the need for *extra supports* to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

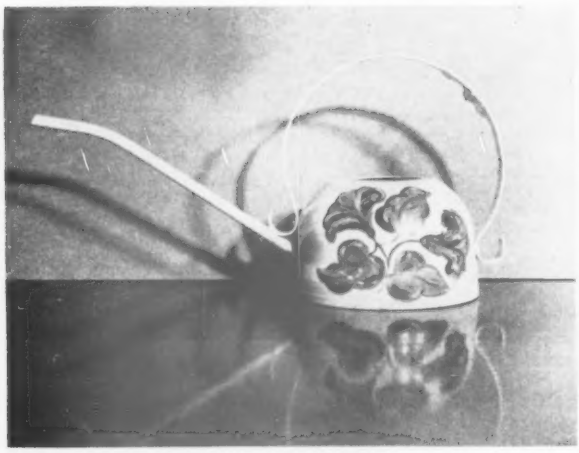
Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

WELDOLETS

*Trade Mark Reg. U.S. Pat. Off. Pat. in U.S. & Foreign Countries

FOR WELDED BRANCH PIPE OUTLETS

When you want Bonney Welding Outlets, ask for WeldOlets*



1—HAND-PAINTED aluminum can for watering plants and flowers should delight heart of almost any woman

2—SPOUT is attached to both can body and handle by brazing at low temperature with an oxyacetylene torch

Aluminum Watering Can

A Detroit manufacturer solved a knotty production problem by the intelligent use of aluminum brazing. Spout and handle are joined to can body at low temperature, using an excess acetylene flame

BY JOHN A. BAIER
Baier and Son, Detroit

HAND-DECORATED sprinkling cans (Fig. 1) are retailing for $2 at leading chain and department stores. These are fabricated from soft, lightweight aluminum by Baier and Son, Detroit. The can itself is spun, but the handle and spout must be joined to it by some metal-fastening process.

The can body is 5 in. in diameter and stands 3 in. high. Complicating factors are the light-gauge material from which the body is spun, and the light ¼-in. tubing constituting the spout. Because of the thin walls of the can and the small diameter of the tubing (wall thickness approximately 0.031 in.), fusion welding is impracticable. It was decided to join the parts by an aluminum-brazing alloy melting at low temperature, and this has worked out very well in actual production.

The handle, an aluminum strip, was formed with reverse curves on the ends. Though this was done primarily for decorative purposes, one of these reverse curves serves as an excellent anchor for attachment of the lightweight spout (Fig. 2). After the handle has been brazed to the can in the proper position, the assembly is jigged on its side with the spout up (Fig. 3), and the spout is brazed to both the can and the handle with a torch and filler rod.

3—ASSEMBLY is jigged spout upward for the brazing operation

Prior to brazing, all parts are thoroughly cleaned with steel wool and fluxed. Brazing is done by means of the oxyacetylene torch, using an excess acetylene flame and a ⅛-in. filler rod of an aluminum alloy that melts at 950 F and flows at 1,050 F.

The weld area is heated broadly but less than for an ordinary aluminum rod. When applied flux has melted completely, the rod also melts and flows smoothly around the joint like silver solder. About ⅛ in. of the filler rod is used for the two joints that connect spout to the can and the spout to the handle. These two critical joints are brazed at the rate of two cans per operator per minute or 15 seconds per joint. There is no breakdown of either the can or tubing nor any heat effect on the handle braze.

Photos courtesy All-State Welding Alloys Corp.

INVINCIBLE
Flux Recovery Systems

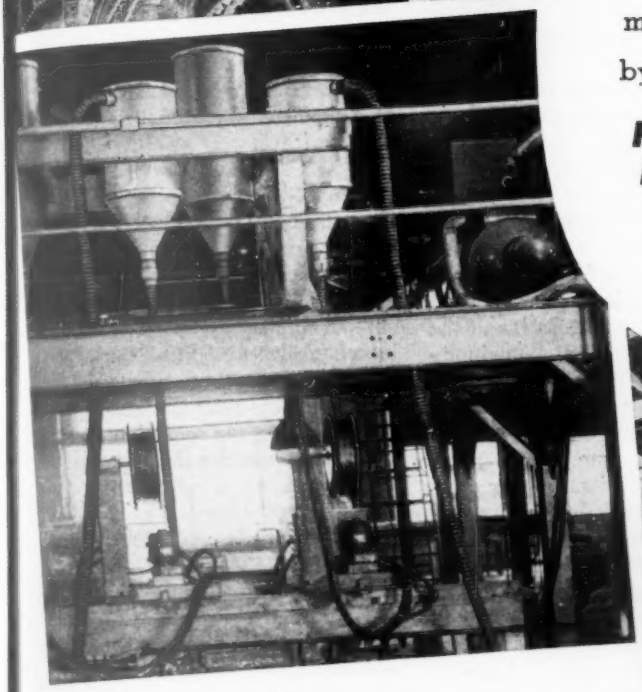
This installation *automatically* salvages useable flux and returns it to hopper of welding head. Circular magnets are being welded.

Quickly Repay Their Costs

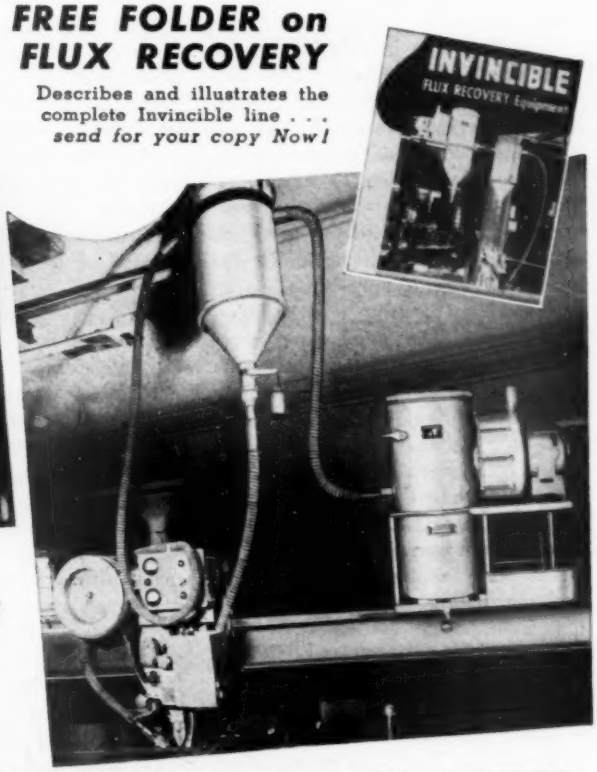
• On submerged arc welding jobs, Invincible Flux Recovery Units save money by: **1** Salvaging *all* unfused flux, **2** Operating far more efficiently than manual methods, **3** Reducing welding rejects by removing all fine dust (flux flour).

FREE FOLDER on FLUX RECOVERY

Describes and illustrates the complete Invincible line . . . *send for your copy Now!*



Flux is being recovered simultaneously from *2* welding heads on this installation. Water tanks are being welded.



Welding locomotive parts. *Only* primary separator tank is elevated, thus eliminating need for another supporting jig.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

SEE INVINCIBLE EQUIPMENT AT BOOTH 2520, NATIONAL METALS EXPOSITION, CLEVELAND, O.

DIES PRECISION WELDED

(Continued from page 62)

the first two hours in the morning can be used for repair. Fatigue and eyestrain then force a cessation on the piece of work until the next day, and the weldor must turn to less delicate work.

Welded Hood Ornament

A job which is typical of those arriving at Weldkraft is the two-piece die for a plastic automobile hood ornament shown in Fig. 7. In this case, the reason for welding is twofold: first, to repair the sections holding the inserts for mounting (broken out as indicated by the lines at the edges of the mold blocks); second, as a remodeling operation. Sections of the cavity were blocked off and filled in so that the shape of the cavity could be tooled to produce the 1949 model of automobile hood ornament.

The first step in this job was to coat the blocks with a spatter preventative. This was followed by coating the cavity adjacent to the section to be welded with carbon paste, as shown in Fig. 8. These operations were done not only to prevent spatter damage but also to minimize damage to the high polish in the cavity by smoke, soot and heat as well as from peening and brushing operations. The mold parts were heated for approximately two hours to a very uniform temperature.

A filler rod of oil-hardening tool steel with an analysis matching that of the mold was selected. The welding was done by the atomic-hydrogen process, using 3/32-in. tungsten electrodes and a current of 17 amp. The welds were applied in thin layers and thoroughly peened to prevent distortion.

After welding was completed, the blocks were returned to the furnace to be brought to a uniform temperature throughout before being pack cooled. The pack consisted of loose asbestos fibre surrounded by an insulating type of firebrick. This type of cooling process takes from 12 to 20 hours.

When cooled, the upper and lower die parts were cleaned and carefully checked to see that the work conformed to the customer's specifications for contour, hardness, etc. Fig. 9 shows the mold parts ready for the die-maker's attention.

Noteworthy jobs Weldkraft has performed include rebuilding of the center bar of the letter "E" on a metal-embossing die (Fig. 5). Each bar is 1/8 in. long by 3/32 in. wide. The steel is a chromium oil-hardening steel containing some tungsten and the filler metal is of the same analysis.

A circular die pattern for forming louvers in a small plastic radio cabinet was badly damaged when it came to the shop. The edges of each ridge on the die were cracked, broken or worn. The tiny deposits of weld metal necessary to repair this damage were no more than 1/8 in. wide and in addition had to be quite straight. Fig. 2 shows the die after repair. A total of five hours was spent putting filler metal on the edges of the manganese oil-hardening tool-steel die.

Fig. 6 shows another radio cabinet job before and after repair. Louver ridges were broken almost to the base of the 4130 steel. Using the atomic-hydrogen torch, the ridges were rebuilt to their original shape as shown at right.

A special welding job is illustrated by the combination blanking and drawing die of Fig. 3. Inside of the die is faced with an aluminum-bronze coating for drawing sheet steel. The outer cutting edges for blanking are manganese oil-hardening tool steel.

For welding equipment, the company has two atomic-hydrogen welders, two a-c arc welders, oxyacetylene torches, kerosene preheating torches and various grinders of the stationary and flexible-shaft types. Some of this equipment is shown in Fig. 1. Two brick-top tables and a supply of firebricks permit construction of almost any size of loose-brick furnace for preheat or postheat operations. The firebricks are also used for pack cooling.

For shop space, the firm occupies a building formerly housing a machine shop and garage at the rear of 2948 West Washington Boulevard, Chicago. A wide alley in back of the shop provides temporary parking space for all but the largest trucks. This location is conveniently located near the west side factory district of Chicago. Within a few blocks are forging shops, small plants, plastics manufacturers and other die users of almost every description. Truck and allied transportation services are especially speedy since Washington Boulevard is a one-way traffic express street.

Equipment at Low Cost

Helpful customers have enabled the shop to procure equipment at low cost. A two-ton portable shop crane was obtained through a suggestion from one of the first customers, who recollected that he had a rusty crane that might be useful for handling large forging dies setting outside in a field beside his plant. Since cable, hook and crank were missing, the customer offered the crane to Weldkraft for $30.

Another customer volunteered use of a truck to bring the rusty crane to the welding shop. After a cleaning job, purchase of used hook, cable and crank mechanism and a coat of paint, Weldkraft had a piece of equipment worth $150 at a total outlay of $37.

It isn't too easy to see the tiny corners and projections of small dies through the tinted welding lens. The need for brilliant illumination was met by designing a small spotlight (Fig. 4). This is simply a No. 2 photoflood lamp protected by a water jacket made from tin cans. The water jacket serves to keep the lamp cool when it is near the welding arc and also keeps the solder on the can seams from melting because of the lamp's heat.

Weldors Must Practice

Proper welding of dies is a skill like that of a concert pianist; it can't be exercised once a month or several times a year but must be painstakingly practiced and kept up continuously if the quality of work turned out is to remain high. A common failing of ordinary job shops as far as die welding is concerned lies in the fact that the average operator has to weld everything from milk cans and fenders to furnace grates. While this may make him an ingenious and skillful jack-of-all-trades, it does not qualify him to make die repairs.

On heavy repair jobs, the quantity of metal deposited per unit of time is the most important. Slight defects such as small craters, pinholes and minor undercuts are often permis-

sible. On die work, such defects would be fatal to the job, so the time element is secondary in importance to quality welding. It is usually not possible for the same weldor to do both kinds of work on short notice; results are bound to be something less than those desired.

Constant "keeping fit" as our weldors do makes it possible for us to accept more and more difficult jobs.

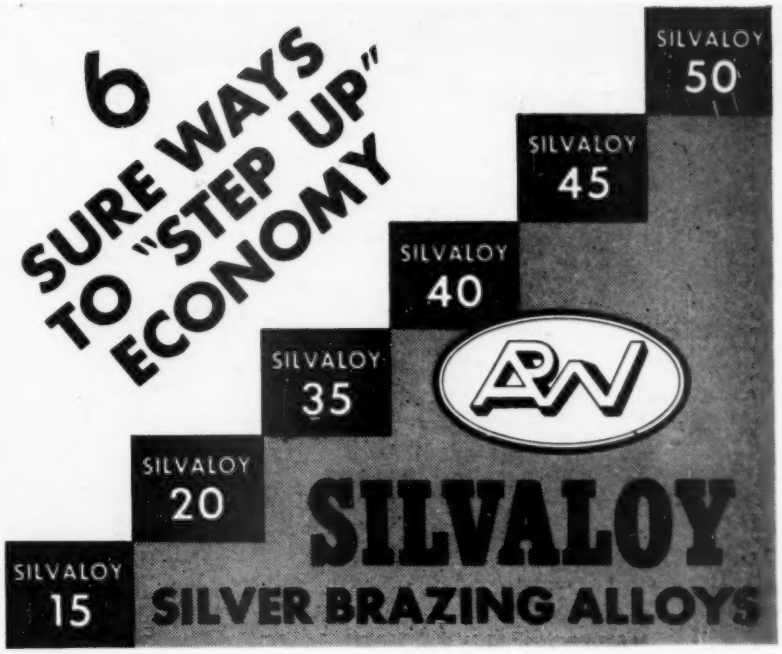
Consulting Service

A valuable feature which Weldkraft offers is its ability to supply metallurgical and consulting services on die work to the client. Many times, by holding an engineering conference between Weldkraft and company representatives before a job is attempted, methods can be worked out to yield a successful result. Simply sending the die out to be welded *could* result in its complete destruction. Weldkraft is also a source of information on fabricated dies and special-purpose materials and their uses, enabling the customer to reduce further the initial cost of dies as well as maintenance costs.

Custom service for each job has another advantage. When Weldkraft is able to suggest the proper preparatory and finishing operations as well as the actual welding, the manufacturer feels that he is getting the most for his money. Auto and appliance factories as far away as Detroit have shipped dies by air to be repaired because of the quality of Weldkraft work. Likewise, plants in nearby Downers Grove, Elgin and Aurora, Ill., are steady customers.

To sum up the story of Weldkraft, it is based on service in many ways. Working hours are from 7:30 a. m. to 5:30 p. m. on week days and from 8 a. m. to 4:30 p. m. on Saturdays; in cases of emergency the customer can bring in dies at the close of his 4:00 p. m. shift and pick them up on his way to work the next morning. For special work, the shop has been open all night and all day Sunday.

Service at Weldkraft is based on solid technical knowledge, experience, proper tools and tested techniques. In my opinion, any shop that tries to do die welding on other than this basis will only succeed in giving the whole welding industry a black eye.



This year's National Metal Exposition has taken as its theme "Economy in Production". In line with this, low temperature silver brazing is frequently the economical answer to many assembly problems.

SILVALOY, the silver brazing standard in industry, may be able to do your job more economically. SILVALOY 15 is a silver-copper-phosphorous alloy, in nation-wide use, for brazing copper and copper alloys. The five other SILVALOY alloys are quaternary silver-copper-zinc-cadmium alloys which meet industry's demand for better, more practical, silver brazing.

SILVALOY means better quality, better results

ALLOY NO.	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 15	15%	1185°F	1280°F
SILVALOY 20	20%	1430°F	1500°F
SILVALOY 35	35%	1125°F	1295°F
SILVALOY 40	40%	1135°F	1205°F
SILVALOY 45	45%	1125°F	1145°F
SILVALOY 50	50%	1160°F	1175°F

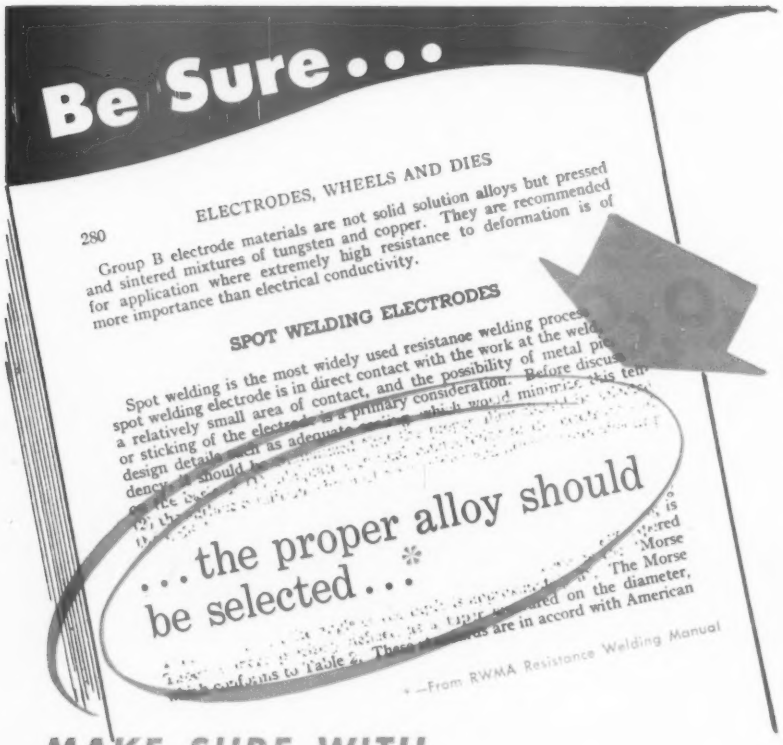
ALSO, A WIDE VARIETY OF OTHER SILVER SOLDERS FOR SPECIAL APPLICATIONS

THE AMERICAN PLATINUM WORKS

Refiners and Manufacturers

PRECIOUS METALS SINCE 1875

231 NEW JERSEY R. R. AVENUE
NEWARK 5, N. J.


Be Sure . . .
280 ELECTRODES, WHEELS AND DIES
Group B electrode materials are not solid solution alloys but pressed and sintered mixtures of tungsten and copper. They are recommended for application where extremely high resistance to deformation is of more importance than electrical conductivity.
SPOT WELDING ELECTRODES
. . . the proper alloy should be selected . . .
—From RWMA Resistance Welding Manual

MAKE SURE WITH

WEIGER-WEED SPOT WELDING TIPS

For top production speed, with fewer dressings be sure you choose the proper alloy for every spot welding job. When properly applied Weiger-Weed Tips assure longer life, sounder, cleaner welds—at lower cost! Standard Weiger-Weed tips, pointed, dome, flat, offset are available from stock—also many irregulars. Specials are promptly produced from specifications. Weiger-Weed supplies electrodes in 13 alloys of proven correct properties for each and every requirement of spot, seam, flash, butt, and projection welding. WW-1 Metal, for example, is best for welding scaly metals, galvanized iron, terne plate, tin plate and other coated metals, aluminum and its alloys. WW-2 Metal gives better performance on cold rolled steel, pickled hot rolled steel, nickel, cupro nickel, nickel silver, chrome plate, phosphor bronze, silicon bronze alloys, stainless steel, etc.

You'll also be interested in the line of Weiger-Weed Water-Cooled Holders—today's outstanding leakless holders—always trouble free. Weiger-Weed & Company, Division of Fansteel Metallurgical Corporation, 11644 Cloverdale Ave., Detroit 4, Michigan.

11506-B

Send for new Bulletin 14.650 with diagrammed illustrations, tables, and price lists.

WEIGER-WEED TRADE MARK

RWMA

ONE OF THE FANSTEEL INDUSTRIES

Resistance Welding ELECTRODES
DIES • TIPS • WHEELS • HOLDERS

QUALIFYING PROCEDURES

(Continued from page 59)

Boiler Code, and an "approved" welding operator. The latter can be employed when the strength of a structure is not dependent on the strength of the weld. Appendix II of the "Recommended Rules" describes a test that an approved operator must pass. He simply makes a butt weld between two steel plates of not less than ¼ in. nor more than ½ in. thickness. Specimens are removed from the welded plates and subjected to bending tests, either in the guided-bend test jig or by other suitable means. The specimens are judged according to the operator qualification bend bars previously described on acceptable defects.

SUMMARY

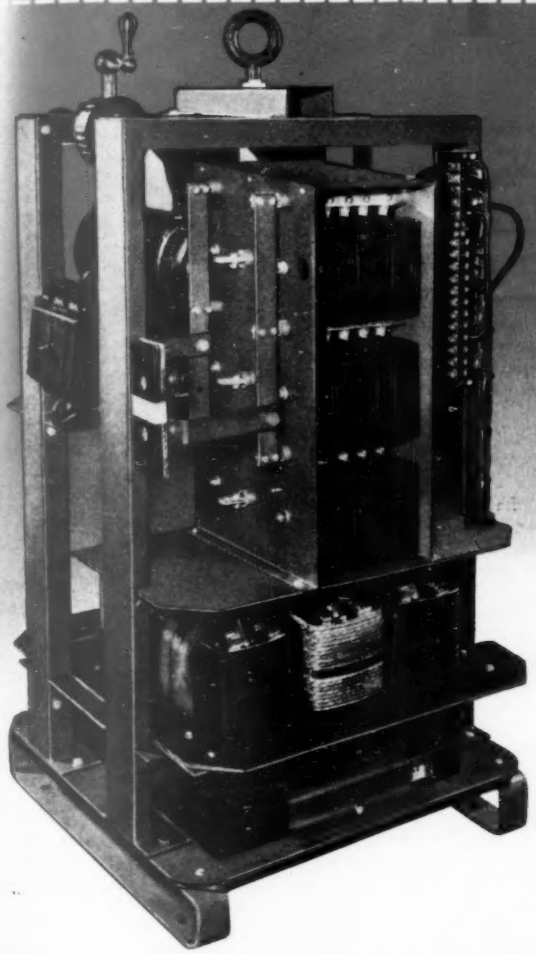
The establishment of proper welding procedures and the qualification of these by tests provide proof that strong, ductile and sound welds can be made on specific materials. The qualification of weldors demonstrates their ability to produce sound welds. When the specified procedures are followed in fabrication or erection, the resultant welds will be equivalent to the test welds in quality.

References

AWS Standard Qualification Procedure.
Standard Qualification for Welding Procedure and Welding Operator, Section IX, ASME Boiler Construction Code.
ASME Boiler Construction Code, Sections I, II, V and VIII.
API-ASME Code for Unfired Pressure Vessels for Petroleum Liquids and Gases.
ASA Code for Pressure Piping.
AWS Standard Methods for Mechanical Testing of Welds.
AWS Code of Minimum Requirements for Instruction of Welding Operators. Part A—Arc Welding of Steels.
AWS Recommended Practice for Inspection of Fusion Welding.
AWS Definitions of Welding Terms and Master Chart of Welding Processes.
National Board of Boiler and Pressure Vessel Inspectors: Recommended Rules for Repairs by Fusion Welding to Power Boilers and Pressure Vessels.
ASTM Standards: Part 1-A including 1948 Supplement, Ferrous Metals.
ASTM Designation: A233-48T, Mild Steel Arc-Welding Electrodes.
ASTM Designation: A316-48T, Low-Alloy Steel Arc-Welding Electrodes.
ASTM Designation: A298-48T, Corrosion-Resisting Chromium and Chromium-Nickel Steel Welding Electrodes.
ASTM Designation: A251-46T Iron and Steel Gas-Welding Rods.

OU CAN BE SURE.. IF IT'S

Westinghouse



NEW!

Selenium Rectifier D-C Welder

SAVES POWER... OPERATORS LIKE ITS QUIETNESS

New D-C Welder replaces motor-generator set with Selenium Rectifier! Lighter... quieter... smaller... more efficient... higher power factor... less no-load losses. Available in 200, 300 and 400-ampere ratings.*

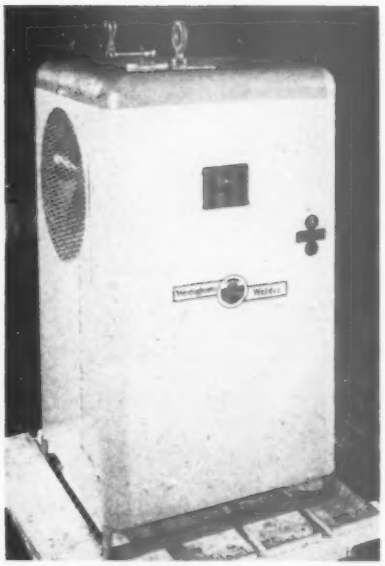
J-21543

SEE it... USE it at
the National Metals Show
Cleveland, Ohio... Oct. 17
Booth No. 2026

Westinghouse

EVERYTHING for Welding ANYTHING!

New products f



NEW D-C WELDER makes use of plate-type (selenium), full-wave, three-phase rectifier

Rectifier D-C Welder

NEW D-C WELDERS that use plate-type rectifiers instead of the conventional rotating components of motor-generator equipment are offered by Westinghouse Electric Corp. They are available in 200, 300, and 400 amp capacities, rated in accordance with NEMA standards for industrial-type, single-operator arc welders.

Major components of these new rectifier type d-c welders are: three-phase welding transformer, three-phase adjustable reactor and a plate-type (selenium) three-phase, full-wave rectifier.

The no-load loss in a 300-amp welder is said to be 500 watts, as compared to 2,480 to 3,600 watts for a conventional motor-generator welder, while power factor at normal operating load conditions is comparable to induction-motor-driven welders. Efficiency at full load is stated to be 66% as compared to 54% for motor-generator welders. Efficiency increases at reduced load conditions, reaching 73% at 20% rated load.

WESTINGHOUSE ELECTRIC CORPORATION, P.O. Box 868, Pittsburgh 30.

* * *

Bar Shear

A NEW BAR SHEAR will shear rounds, angles, bars and squares without changing tools. It provides a 48-in. base for mounting tools, which include two sets of angle shears, one shear for handling squares and shears to handle three sizes of round bars. The machine is available in capacities of from 50 to 450 tons.

BEATTY MACHINE & MFG. CO., Hammond, Ind.

NEW PRODUCT BRIEFS

Lightweight reel for light electric cord weighs only 9 lb. Capacity is 150 ft of No. 16 two-conductor cord. Industrial Electrical Works, 1509 Chicago St., Omaha 2, Nebr.

* * *

Welded wire cloth has a special construction eliminating the crimping or interlocking usually found in such material. It makes possible use of finer gauge wires for the same mesh sizes since all cross wires lay on the same side. Cloth comes in galvanized or plain steel finish. Wickwire Brothers, Inc., Cortland, N. Y.

* * *

Diaphragm relief valves for air and hydraulic systems up to 250 psi offer the user high volume relief without blowdown. All parts in contact with the gas or fluid handled are brass; diaphragm is made of synthetic rubber reinforced with nylon. C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colo.

* * *

Electric hone sharpener is plugged in a 110-volt a-c outlet, and the starter button pressed. Honing is then done with both hands free to hold the tool being sharpened. Syncro Corp., Rochester, Mich.

* * *

No obstruction along the drawing area is the chief feature of a new model D "Wrigraph" drafting machine. Free movement of scales over the entire drawing area is possible because the only fastening point used is at the extreme right of board. L. G. Wright, Inc., Cleveland 21.

* * *

Manually operated starters for a-c motors up to 7½ hp are introduced to complete the line of G-E starters of this type. The new starters, specially designed for use on farm machinery, textile looms, small pumps, blowers and grinders, are furnished in both toggle and push-button types in 2, 3, and 4 pole forms, sizes 0 and 1. A feature is the bimetallic overload protection, which replaces the solder-pot relay and is said to provide exceptionally accurate response to overloads. General Electric Co., Control Division, Schenectady 5.

SINGLE-GUN Grahm stud-welding cabinet requires no timing devices, only a foot pedal

Graham Stud Welder

A SINGLE-GUN machine (see illustration) has been added to the Graham line of welding equipment. The basic principle of the Graham welder is a capacitor-operated, self-timed device using tip studs of up to ½ in. Stud comes into contact with the work and fuses, causing ionization. This, in turn, allows a path for the main discharge current of the capacitor to form an arc sufficient to melt both the full diameter of the stud end and the workpiece directly under it. There follows a hammer blow that causes the pieces to weld. This complete cycle is brought about by a rapid, continuous movement of the stud-holding part. The time of arc is about one mil second, which makes possible use of very high currents. Welder operates on three-phase, a-c, 110, 220 or 440 volts.

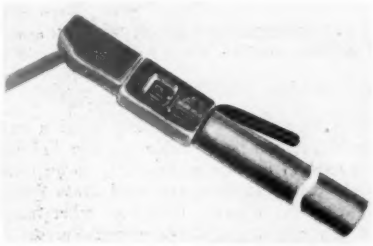
Some of the advantages of the extremely short arc time are said to be: concentration of heat, welding of studs on very thin metal, no fillets, no distortion, no marring on back of plated or painted surface, no flux necessary, welding of dissimilar metals possible, low energy consumption. There are only two moving parts in the gun.

Some of the metals and alloys which can be welded by this process are steel, stainless steel, Monel, aluminum, magnesium, zinc, copper and, in some cases, combinations of these metals and alloys.

GRAHAM MFG. CORP., 1541 East Eight Mile Road, Ferndale 20, Mich.

ts for welding

A d-c welder that replaces the conventional m-g unit with a plate-type selenium rectifier heads October's New Products. Another interesting development is an electrode holder to operate at 700 amp



COOL-OPERATING electrode holder is said not to heat with ⅜-in. rods and 700 amp

Heavy-Duty Electrode Holder

NEW HEAVY-DUTY MARTIN WELLS 6S electrode holder is said to operate under continuous duty-cycle at 725 amp with ⅜-in. electrodes and remain cool. Manufacturer cites the case of one user who welded 36 E-6020 ⅜-in. electrodes at 725 amp and found that the holder could be held in his bare hand at all times.

Silver-brazed cable connections and size 4/0 cable are recommended for use with this holder on 600-700 amp. Electrodes are held and fixed in a 60-deg or 90-deg position by cam "bulldog" action. Manufacturer states the cam action gives a positive contact on the electrode and reduces the heating on both the stub and the holder. Length is 15 in., weight is 32 oz.

MARTIN WELLS, INC., 5886 Compton Ave., Los Angeles 1.

* * *

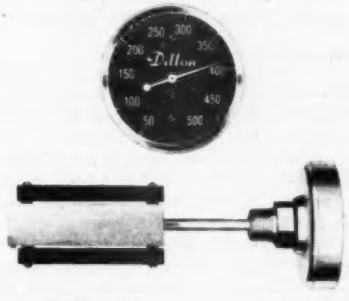
Sub-Zero Steel

DEVELOPMENT of a new alloy steel enables sub-zero service as low as —423 F, its makers state. "Lebanon grade 22" is an austenitic cast ferrous alloy containing 19.5% chromium and 9% nickel, among other constituents. It is believed to have particular usefulness for applications in the oil, chemical and processing industries and has already been used effectively to produce steel castings for pressure equipment to store the liquid oxygen used as the propellant of rocket engines.

A significant feature claimed for this new alloy is its weldability by either gas or electric processes. No subsequent heat treatment is needed since low temperatures do not seriously impair the as-welded impact resistance. No embrittlement from the low temperature has yet been noted in the cast alloy, in welds or in adjacent fusion zones.

LEBANON STEEL FOUNDRY, Lebanon, Pa.

* * *

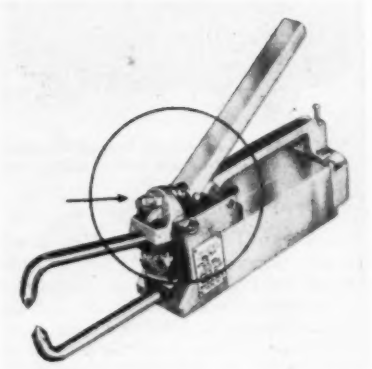


NEW MAGNETIC thermometer might be used to check preheat temperatures before welding

Magnetic Thermometer

FOR INDICATING heat where round-stem instruments do not fit, the Dillon flat-stem magnetic thermometer is said to have many uses. Nine different temperature ranges are available: 0-200 F, 50-300 F, 50-500 F, 150-750 F, 200-1,000 F, 0-100 C, —10-110 C, 0-150 C and 0-300 C. The large flat area gathers and retains heat from the surface under test. The magnets enable the operator to place the instrument on any flat steel surface and "peel" it off in an instant.

W. C. DILLON & CO., INC., 5410 West Harrison St., Chicago 44.



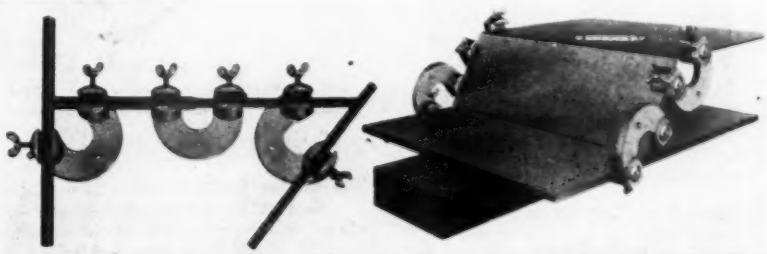
TOGGLE-ACTION tong lever gives greatly increased pressure without effort by worker

Portable Spot Welder

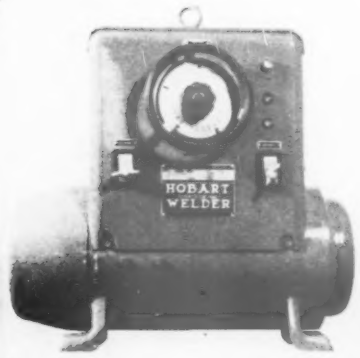
A REDESIGNED Miller portable spot welder has been fitted with a new toggle-action tong lever said to result in greatly increased tong pressure, better spots and easier operation. The lever may be adjusted either to close tight on the work or to pivot past center and lock on the work. The operator closes the welder on the material to be spotted—forcing it up tight and locking it together—then operates the switch with the other hand. It doesn't take muscle to operate this new model, states manufacturer.

The new welder will handle stainless and mild steel up to ⅛-in. combined thickness, galvanized up to two pieces of 20 gauge. An adjustment is provided between the lever and the tongs to compensate for various thicknesses of metal. At the rear of the handle another adjustment regulates the distance the handle closes. The spot welder may be used either with or without timer control.

THE MILLER ELECTRIC MFG. CO., Appleton, Wis.



NEW "PRO-CLAMP" HOLDS plates, bars or tubing for welding, brazing or soldering. It consists of a U-shaped frame similar to a pair of arms. At the ends of the arms, two clamps grip two workpieces at any angle from 0 to 180 deg. Frame of the tool is inscribed with two accurate protractor scales and is provided with locks for setting clamps tightly. Present 5½ by 8 in. model accommodates thickness and diameters up to 1 in., weighs 3 lb. It is made from a spatter-resistant material. Bernard Welding Equipment Co., 741 East 71st St., Chicago 19



LOW-COST Hobart welders include 200-amp motor-driven model. Range is 40 to 250 amp

D-C Welder

A NEW LINE of low-cost d-c welders known as the "Bantam Champ" line is being offered by Hobart Brothers. Illustrated is the motor-driven MZ-200-S, rated at 200 amp at 30 volts on 50% duty cycle. Current range is from 40 to 250 amp at an operation speed of 3,450 rpm. Unit is 26¼ in. long, 18 in. wide, 25 in. high (stationary) and weighs approximately 340 pounds.

Generator is a modified multirange type with four laminated main poles and four removable interpoles. Four heavy-duty generator brushes are held in a fixed neutral position by patented single-unit brush rigging.

Welding controls are modified multirange dual control, with five ranges of welding current and 100 steps of volt-ampere adjustment in each range, making available 500 combinations of open-circuit voltage and welding current for selecting desired arc characteristics. Main switch is heavy copper, molded in bakelite, controlled by a large hard-rubber-covered hand wheel. Volt-ampere adjuster is compactly built behind the main switch.

Voltage changeover terminals are provided on the starting switch. Motor leads are brought out to the terminals on the starting switch and can be reconnected to change from 220 to 440 volts power supply and vice versa.

HOBART BROTHERS Co., Box 489, Troy, Ohio.

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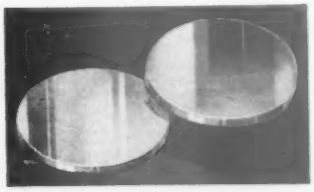


COATED lenses for oxyacetylene welder's goggles reflect rays from mirror-like surface

Coated Welding Lens

ADDITION of goggle lenses to the American Agile Corp. "Metalklad" line is announced. These lenses have a hard nonferrous metal alloy coating of high reflectivity on one surface. The mirror-like surface reflects all harmful rays given off by the torch flame and results in greatly decreased eye fatigue, it is claimed.

Vision is more sharp with these lenses compared to the ordinary lenses, the manufacturers claim, with a 17 to 28% increase in efficiency possible. The goggle lenses are available in shades 2 to 6 in 50 mm size to fit all standard goggles.

AMERICAN AGILE CORP., 5806 Hough Ave., Cleveland 3.

* * *

HEAVY-DUTY welding positioners have capacities ranging from 3,000 to 6,000 lb

Heavy-Duty Positioner

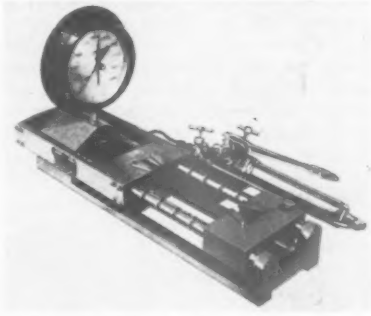
FOUR MODELS of Aronson welding positioners of the heavy-duty gear-driven type augment the "Universal Balanced" line of positioners. These models are HD 3000, HD 4000, HD 5000 and HD 6000, having capacities of 3,000, 4,000, 5,000 and 6,000 lb respectively.

Variable-speed drive of the worktable enables speeds to range from 0 to 0.75 rpm. The table tilts 135 deg in 40 seconds. Elevating base is adjustable up to 24 in. Longer T-slots on the new models are said to provide greater adaptability.

Other features common to all Aronson positioners are enclosed motor and speed reducer units with controls conveniently located at one side of the machine.

ARONSON MACHINE CO., Arcade, New York.

* * *



FIELD TESTING of specimens from welded piping done with 40,000 lb hydraulic tester

Pipe Weld Tester

FOR making field tests on welded piping, a new portable tensile testing machine, Model PO-40, will test specimens from 6 to 13 in. in length and up to ⅜ in. thick and 2¼ in. wide. Capacity of the machine is 40,000 lb.

Operation is hydraulic, pressure being built up by a hand pump built integral with the base. Said to be easily adjustable, the machine weighs 200 lb, light enough to be carried by two men.

The tester is furnished complete with pump, which contains its own oil reservoir and an easily read dial gauge.

STEEL CITY TESTING MACHINES, INC., 8843 Livernois, Detroit 4.

* * *

SMOOTH SURFACES are obtained with new finishing machine, which polishes, and rubs

Finishing Machine

FOR STRAIGHT-LINE polishing, sanding and rubbing, a new portable electric finisher is said to operate as smoothly as an electric drill. It does not sand cross grain, cut swirls, winkers, chains or other hard-to-cover patterns, states manufacturer. A streamlined rear handle provides for one-hand operation.

DETROIT SURFACING MACHINE CO., Dept. WE, 7433 West Davison, Detroit 4.

* * *

SAFETY switch for hoists shuts off lifting motor when excess weight is put on hook

Crane Overload Switch

FOR preventing accident and injury due to overloaded cranes, a new safety device automatically shuts off the hoisting motor when an excess load is put on the hook. Called the Dillon "Dyna-Switch," it slips onto the hoist or crane hook so that the load may be lifted directly beneath it in the usual way. The U-shaped tool steel bar of the switch opens and closes the circuit of a micro-switch as loads are lifted.

W. C. DILLON & CO., INC., 5410 West Harrison St., Chicago 44.

* * *

Dry Lubricant

"MOLYKOTE, type Z," is a specially prepared, smooth-textured molybdenum compound powdered lubricant said to have exceptional chemical and thermal stability. It may be applied dry in the powder form or mixed with solvents, oils or greases. Lubricating characteristics are not affected by temperature from the sub-zero range up to 750 F, the makers claim.

THE ALPHA CORP., Greenwich, Conn.

FOSTER *Announces . . .*

REMOTE CONTROL FOR DC ARC WELDING MACHINES!

Here is REAL "Economy In Production"

This Remote Control enables the welder to start and stop the machine, select straight or reverse polarity, and exercise complete variable control over the full range of the welding machine, *RIGHT AT THE ELECRODE HOLDER!*

SEE THIS REVOLUTIONARY REMOTE CONTROL *IN OPERATION*
AT BOOTH 1025 — Metal Show — Cleveland

●

PLEASE SEND ME MORE INFORMATION ON THE REMOTE CONTROL FOR DC ARC WELDING

I AM ASSOCIATED WITH: Jobber ( ) Mfg. ( ) Contractor ( ) Sales Agency ( ) Other ( ) If "Other" Explain:

WE HAVE THE FOLLOWING DC WELDING EQUIPMENT: (Indicate Number of Machines)

LINCOLN: 200 AMP ( ) 300 AMP ( ) 400 AMP ( ) 500 AMP ( ) 600 AMP ( )

HOBART: 200 AMP ( ) 300 AMP ( ) 400 AMP ( ) 500 AMP ( ) 600 AMP ( )

G-E: 200 AMP ( ) 300 AMP ( ) 400 (AMP ( ) 500 AMP ( ) 600 AMP ( )

WESTINGHOUSE: 200 AMP ( ) 300 AMP ( ) 400 AMP ( ) 500 AMP ( ) 600 AMP ( )

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Ampco* Makes Seam-Welder Shafts Last Longer on High-Pressure Jobs

— reduces welding and forming costs on aluminum, stainless steel, tubing, etc.

Outer Sleeve — Ampcoloy 97 or 95
Roller or Sleeve Bearings — Ampcoloy 86
Inner Sleeve — Ampcoloy 97 or 95
Shaft — Ampcoloy 95 or 97
An AMPCo alloy
An AMPCo alloy
An AMPCo alloy
An AMPCo alloy

AMPCO triples shaft life . . . CUTS resistance-welding COSTS

Proved by savings in maintenance and downtime — in Indiana Plant

Ampco Metal sleeves and bearings give this shaft the guts to take the heavy punishment of forming and welding in one high-pressure operation. Analyze your own jobs — see how durable Ampco products can make similar savings for you!

This combination of toughness and hardness in Ampcoweld tips and wheels resists mushrooming and wear. Their high electrical conductivity resists sticking to work. They require less dressing. That's why you can count on minimum downtime, top production — greater profits. All Ampco resistance-welding products meet R.W.M.A. specifications.

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Ampco Metal, Inc.
Milwaukee 4, Wis.

West of the Rockies it's the Ampco Burbank Plant, Burbank, California

Send for detailed information on Ampco Resistance Welding

Tear out this coupon and mail today!

Ampco Metal, Inc., Dept. WE-10, Milwaukee 4, Wis.

Please send me Bulletin 68B.

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Company.....

Company Address.....

City..... (.....) State.....

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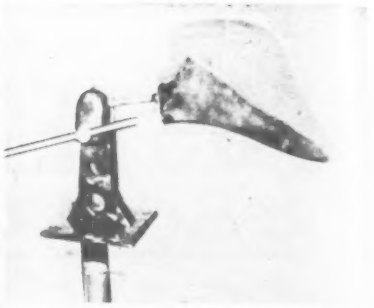
*Reg. U. S. Pat. Off.



PLOWSHARE welding is simplified by "Commando" positioner, which handles to 200 lb

Positioner for Plowshares

"COMMANDO" positioner for plowshares and similar work will hold parts up to 2 in. thick and weighing 200 lb. It is especially suitable for plowshares because the holding fixture is a three-contact arrangement. Pressure is exerted in the opposite direction from that caused by the welding. This feature is said to eliminate warpage almost entirely.

Mechanism is of the ball-and-socket type, and part being welded may be turned in any position. Position is changed with slight pressure of the hand or fingers. Positioner may be mounted on a bench or on an inexpensive stand which can be made in any shop.

J. M. RAGLE INDUSTRIES, 4029 Indiana Ave., Kansas City 4, Mo.

* * *

Pallet Crane

FOR HANDLING bulky objects such as castings, dies, motors, packages of electrodes, etc., the No. 40-PC portable pallet crane has been found useful. Weights up to 500 lb can be lifted from floor level to 5½ ft high. Standard model has a hand-operated hydraulic lift, but motorized operation is available on request.

GRAND SPECIALTIES CO., 3135 West Grand Ave., Chicago 22.

* * *

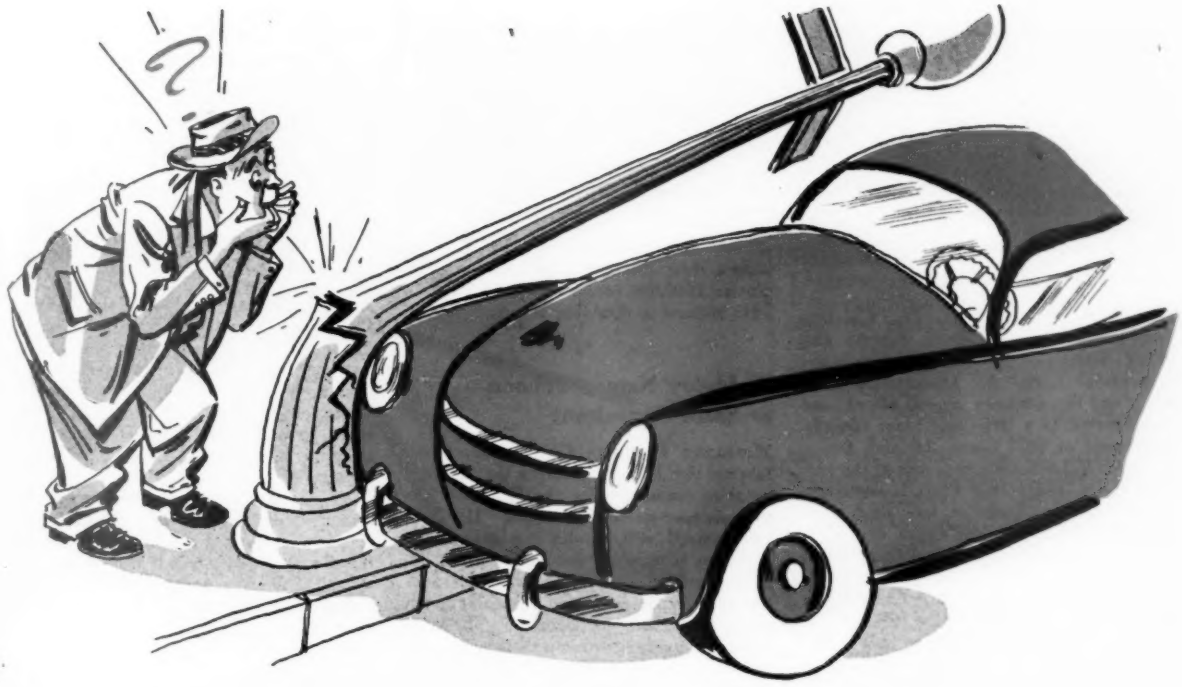
Spatter-Proof Compound

COMBINATION spatter-proofing compound and rust-preventive "Protect-O-Metal No. 8" is applied prior to welding with brush, spray or by dipping. It dries in an hour to a thin, transparent coating, which is claimed to prevent rust for six months outdoors and up to two years on steel stored indoors. The coating is also said to prevent adhesion of flash and weld spatter and to save up to 85% of the time required to clean welds. Coating will not cause porosity nor harm the weld in any way and can be safely used on any metal surface, the makers claim.

Other uses are in protecting beveled plate edges from rusting prior to welding and to protect overlapped sections inaccessible for painting. The product is delivered ready for use in 1, 5 and 55 gal drums.

G. W. SMITH & SONS, INC., 5400 Kemp Road, Dayton 3, O.

(*Continued to Page* 112)



HAVE YOU A FRACTURE PROBLEM? DON'T WORRY—

WELD IT IN A HURRY WITH REVERE #456 BRONZE WELDING ROD

THE "FLAME-TESTED" ROD IN THE DISTINCTIVE RED, WHITE AND BLUE PACKAGE

The longer a piece of equipment is out of service the more it costs. You can cut this costly down-time by using Revere #456 Low Fuming Bronze Welding Rods for maintenance and repair jobs. They help you get equipment back into service faster because they save 3 ways:

1 **FASTER PREPARATION**—Time is saved in preparing the parts to be joined as the high strength of Revere #456 permits wide assembly tolerances, yet provides strong, neatly-finished joints.

2 **NO HIGH PRE-HEATS AND POST-HEATS**—You save on the time and fuel costs involved in preheating because the low melting point of Revere #456 (about 1600° F.) reduces the need for high preheats and post-heats.

3 **LESS "CLEAN-UP"**—Because it is low fuming Revere #456 enables you to get more accurate placement of the weld metal . . . saves on "clean-up" costs.

Next time you have a fracture problem in cast or malleable irons, wrought iron, cast or wrought steel, cast or wrought bronze, try Revere #456. Once you've worked with this "flame-tested" rod you'll see how it cuts costs, saves time and gives better results. Make Revere #456 prove itself. Order a package today.

Other Revere Welding Rods are: Revere Bronze 380, Manganese Bronze, Herculoy, Phosphor Bronzes, Brass (Brazing Rod), Silicon Deoxidized Copper and Electrolytic Copper. All come in 100-pound cases or in 25-pound cartons, net weight, and are stocked by Revere Welding Rod Distributors in all parts of the country. Write for folder giving technical data.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities. Distributors Everywhere.

News of the Industry

Mid-States Welder Under New Ownership

MID-STATES WELDER Mfg. Co., Chicago, has acquired the goodwill, patents and other assets of the former Mid-States Equipment Corp. All production equipment and the company general offices have been moved to a large new plant recently purchased at 6025 South Ashland Ave.

Frank V. Lockefer is president of the new Mid-States, and Henry Cleys is secretary-treasurer. Mr. Lockefer has long been identified with the Mid-States line. Mr. Cleys is president of Electrical Contractors, Inc., Chicago.

The new company is continuing production of the Mid-States line of a-c arc welders (additional models are planned), high-frequency arc stabilizer and carbon-arc torch as well as the parts and accessories necessary to the servicing of these products. An auxiliary product, a saw gun, is also being produced.

* * *

Weltronic Factory Destroyed by Fire

A FIRE ESTIMATED to have caused damage amounting to $250,000 completely destroyed the plant of the Weltronic Co. at 19500 W. Eight Mile road, Detroit. Blackened walls and heaps of rubble were all that remained of the 60 by 270 ft building after the blaze had been extinguished on August 17. Fortunately, valuable files and blueprints stored in the front office were saved. Cause of the fire was not known.

The plant, according to owner C. J. Collom, will be rebuilt as soon as possible, perhaps at another location. The company manufactures electronic controls for resistance welding and also battery chargers, electronic hot-dog cookers and other electrical devices. Temporary headquarters have been set up for servicing the many r-w controls installed by Weltronic in Detroit auto plants.

* * *

American Optical Honored for Safety Goggle Campaign

A CERTIFICATE of honorable mention has been received by American Optical Company's advertising department for its institutional advertising campaign promoting a wider use of safety goggles. The certificate was awarded by the National Industrial Advertiser's Association at its recent 25th annual conference in Buffalo, N. Y.

American Optical Co. has also received the Distinguished Service to Safety Award, highest honor bestowed by the National Safety Council for excellence in industrial safety. This award was won by the company's New England plants for working almost 3,000,000 consecutive man-hours in 1948 without a disabling injury.

* * *

Weldaloy Names Tebben as Sales Consultant

WELDALOY PRODUCTS Co., Detroit, is retaining the John D. Tebben Co., Detroit, as sales consultant for the Weldaloy line of resistance-welding products. Mr. Tebben himself will handle the assignment. Weldaloy is rounding out its line generally, adding several new products, and is adding sales representatives in specific territories throughout the country. The company maintains its own laboratories and specializes in metallurgical research under the direction of Robert Shroder, for many years associated with Dr. W. F. Hess at Rensselaer Polytechnic Institute.

Mr. Tebben, the new sales consultant, is a former vice-president of the American Welding Society and past chairman of the Detroit and Indiana sections.

* * *

Portland Distributor Uses Business Airplane

W. T. PETERS, owner and manager of Welders Supply Co., Portland, Ore., increases his business efficiency by flying parts and supplies to distant customers. His airplane is the Ryan-built Navion (see THE WELDING ENGINEER, August, 1949).

Recently a customer in Bend, Ore., 200 miles from Portland, made a long-distance telephone call asking about rush service on a new 300-amp d-c welder. Mr. Peters agreed to meet the customer at the Bend airport two hours later. At Bend, Peters looked over the customer's old welder and secured an order for the new model. He gave the customer a 15-minute "good-will" ride over Bend and flew back to Portland. Total elapsed time for the deal was four hours.

Peters took his first flying lesson at the age of 61. In the five years since then he has flown on tours to Alaska, Mexico, Portland, Me., down the Atlantic coast to Key West and to Death Valley, Calif.

* * *

Conference on Hydraulics at Chicago, Oct. 26-27

FIFTH ANNUAL meeting of the National Conference on Industrial Hydraulics will be held October 26-27 in the Sheraton hotel, Chicago. Otto J. Maha, vice-president of the Hannifin Corp., Chicago, is director of the conference. The seven societies which coöperate in sponsoring the meetings are the Western Society of Engineers, American Society of Lubricating Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, Society of Automotive Engineers, American Institute of Chemical Engineers and the Institute of Aeronautical Sciences.

* * *

"Vosco" New Distributor Located at Newton, Mass.

J. E. VOSBURGH, Paul V. Galambos and Buckley R. Reed, three men well known in the welding industry, have got together to form the Vosco Electric Sales Co., a new arc-welding distributor to serve the states of Maryland, Delaware, Pennsylvania, New York and New England. Headquarters will be at 11 Court St., Newton, Mass.

Mr. Galambos and Mr. Vosburgh were formerly connected with Glenn-Roberts Co., Inc., and Mr. Reed was formerly with the Raytheon Mfg. Co. The entire personnel of the new concern have been associated with welding for a minimum of 12 years.

* * *

Krypton and Xenon Produced in Quantity

KRYPTON AND XENON, rare gases in the atmosphere, are being produced on a large-scale basis and at reduced prices after five years of development and research by The Linde Air Products Co. These gases are inert and do not combine with other elements under any conditions. Krypton occurs in the atmosphere one part in one million, xenon one part in twelve million.

Compared to argon, the inert gas now being used extensively for the inert-arc welding process, krypton and xenon are said to offer advantages of lower thermal conductivity, lower electrical resistance and lower ionizing potentials.

* * *

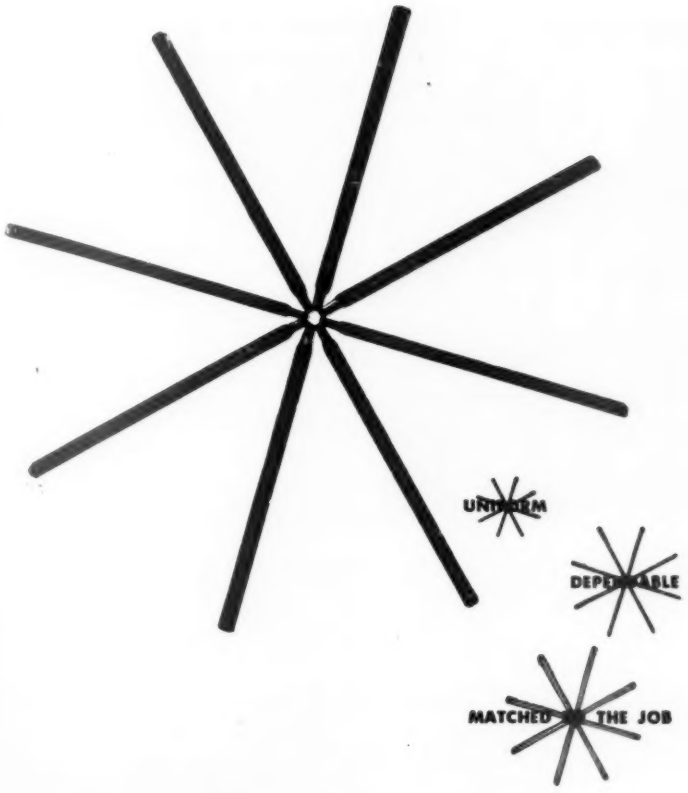
German Welding Periodical Published at Hannover

THE GERMAN ASSOCIATION of Welding has commissioned Dr. Helmut Koch to publish a monthly periodical *Schweissen und Schnieden* (Welding and Cutting) to cover the fields of all welding processes in Germany. Articles from all over the world will be included in the new magazine's editorial material. Address of the publication is Technische Hochschule, Welfengarten 1, Hannover, Germany.

* * *

American Welding & Mfg. Will Produce Steel Doors

AMERICAN WELDING & Manufacturing Co., Warren, O., has begun production of flush hollow steel doors for homes, marking the company's entrance into the consumer field. Sales of the new doors will be handled through a recently established building products division and will be sold through a nation-wide dealer organization.



EIGHT WINNERS FOR MILD STEEL WELDING

In the "Select 70"—seventy electrode types designed and selected by Metal & Thermit to cover every welding requirement at peak performance—eight rods matched to the various demands of mild steel welding permit easy choice of the *right* electrode for any mild steel job.

GENEX—for all-position work and bridging gaps.

TYPE FHP & TYPE F—for high speed, highest quality positioned work.

TYPE R—for sound weld metal on jobs involving vertical and overhead welding.

TYPE A—for general purpose welding with AC.

TYPE U—for structural welding with AC or DC.

ALTERNEX—for light gauge AC applications.

TYPE D—a new design for downhand welding and cover heads.

M & T products include M & T's "Select 70" group of electrodes. M & T AC and DC welding machines and M & T welding accessories. The line is complete, providing everything needed for arc welding . . . arc welding of top-notch quality. Write today for descriptive data.

METAL & THERMIT CORPORATION
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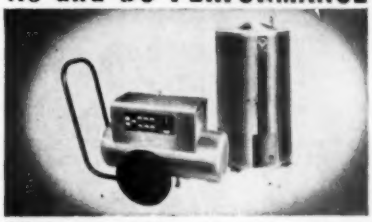
NEWARK · PHILADELPHIA · PITTSBURGH · SO. SAN FRANCISCO · TORONTO

NEW ARC WELDERS BOOST AC and DC PERFORMANCE



FASTER welding, better quality welds, lower power costs, and simplified maintenance are furnished by a new line of AC and DC arc welders introduced by Metal and Thermit Corporation.

Built-in capacitors for high power factor, wide current range for full rated output, and, fingertip, stepless current control for precise current setting are featured in the AC units. Available in 150 to 500 amp. models for manual arc welding, additional models for inert arc and automatic welding.

Full capacity, rugged duty DC arc welders are compact, light in weight—half the size and half the weight of older types—and are equipped with simplified current control, automatic electrode selector. Furnished in 150 to 400 amp. sets—motor driven, engine driven or belt drive.

Descriptive folder gives full particulars. Address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

ACCESSORY DIVIDENDS DECLARED

UNDERSCORING the importance of proper accessories to top welding performance, more and more fabricators are taking pains with selection of accessories. Speedier, lower cost, safer and improved welding are assured when such items as helmets, shields, holders, connectors, cleaning tools and protective clothing are carefully selected. And more and more fabricators—sold on M & T electrode and arc welder performance — are specifying the M & T line of "accessories to the perfect weld." For descriptive literature, address Metal and Thermit Corporation, 120 Broadway, New York 5, N. Y.

FOR HARDFACING AND REPAIR

Amsco® WELDING PRODUCTS

Toolface

FOR HARDNESS AND TOUGHNESS

Ask for free reprint of Hard Surfacing by Fusion Welding

Hardfacing with Amsco TOOLFACE provides the necessary toughness and wear resistance for parts like the trunnion wheels of this lime kiln. The wheels operate in an abrasive limestone dust under 40 tons pressure. TOOLFACE is recommended for abrasion resistance at high temperatures (up to 1100°F.) where toughness is required . . . in this range TOOLFACE is both harder and tougher than the popular cobalt base alloys (No. 1 and 6). Typical uses for TOOLFACE are in steel mill tong bits . . . open hearth charging ram peels . . . chipper knives and tube cleaners in lumbering . . . and in metalworking cutting tools for lathes, shapers, and similar machines. TOOLFACE rods and electrodes are of a high speed tool steel composition . . . are readily welded to mild steel bases . . . have a deposit hardness of 575-675 BHN. Parts after welding may be forged, softened for machining and re-heat treated to original hardness. Write for Bulletin 1047-W.

American Brake Shoe Company

AMERICAN MANGANESE STEEL DIVISION

332 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
Offices in principal cities. Made and sold in Canada by Canadian Ramapo Division of Joliette Steel Ltd., Niagara Falls, Ont.

Southwest to Have Welded Pipe Mill

PRODUCTION of welded line pipe and casing is expected to be a part of operations of Lone Star Steel Co., Lone Star, Texas. Present company facilities include ore mines, coal mines, blast furnace and coke plant. The piping will meet API specifications of J-55 and N-80 quality in sizes from four in. up to 20 in.

Project when completed will be the only plant in Texas to produce oil field tubular steel products. The new construction has been made possible by an RFC loan of $34,000,000. The company will be required to invest $22,000,000 in the project and provide up to $4,000,000 in working capital.

• • •

Weld Compressor Rotor in Supersonic Test Tunnel

DISCLOSURE of operating details on the fastest of three giant tunnel installations for studying supersonic flight, made recently by the National Advisory Committee for Aeronautics and the Allis-Chalmers Mfg. Co., reveals a tricky welding job in the 4 by 4 ft tunnel at Langley Aeronautical Laboratory in Virginia.

The Langley tunnel permits the use of test models large enough for the installation of extensive intrumentation. A key element of the new research unit is a specially designed axial compressor which generates a flow of up to 870,000 cu ft of air a minute. The seven-stage, 11-ft-diam, 1,137-blade compressor operates at tunnel pressure of from 0.25 to 2.5 times atmospheric pressure and requires up to 60,000 hp to drive it. It circulates air through the test section of the tunnel at velocities ranging from 1.2 to 2.2 times the speed of sound. Tremendous size of the tunnel compressor—it is 11 times larger in volume of air handled than the largest standard commercial compressor built to date—can be imagined from its total weight of 140 tons.

The bladed rotor weighs about 65 tons. Tip ends of the rotor blades are approximately 11 ft in diameter and travel at a speed of around 560 miles an hour when the unit is running at maximum speed. Unusual size of the compressor rotor called for construction of seven forged steel discs and two forged steel shaft ends to be welded together. This welding was accomplished in a special heating unit with an insulated housing. The need for very accurate final balancing of the finished rotor required close machining of discs and shaft ends prior to welding and the prevention of warping during the welding operation.

• • •

Stress Analysis Society Plans New York Meeting

ANNUAL MEETING of the Society for Experimental Stress Analysis will be held at the Hotel New Yorker, New York City, on Nov. 30 to Dec. 2, inclusive. Inquiries should be addressed to the Society at P. O. Box 168, Cambridge, Mass.

Electrodes, Wires, Fluxes

for welding MONEL · NICKEL · INCONEL

MONEL

Oxy-Acetylene	"40" Monel Gas Welding Wire	For welding Monel* using INCO "3" Gas Welding and Brazing Flux
Oxy-Acetylene	"43" Monel Gas Welding Wire	For welding heavy sections of Monel for acid pickling service – no flux required.
Metal-Arc	"130X" Monel Welding Electrode D.C.	For welding Monel
Metal-Arc	"140" Monel Welding Electrode D.C.	For welding Monel to steel and overlaying Monel on steel
Submerged Melt	"50" Monel Wire	For welding Monel
Inert Gas Metal-Arc	"60" Monel Wire	For welding Monel

NICKEL

Oxy-Acetylene	"41" Nickel Gas Welding Wire	For welding of pure Nickel – no flux required
Metal-Arc	"131" Nickel Welding Electrode D.C.	For welding pure Nickel or "L" Nickel; and Nickel to steel
Submerged Melt	"51" Nickel Wire	For welding pure Nickel
Inert Gas Metal-Arc	"61" Nickel Wire	For welding pure Nickel

INCONEL

Oxy-Acetylene	"42" Inconel Gas Welding Wire	For welding Inconel* using INCO "2" Gas Welding Flux
Metal-Arc	"132" Inconel Welding Electrode A.C.-D.C.	For welding Inconel; and Inconel to steel
Metal-Arc	"133" 80/20 Nickel-Chromium Welding Electrode A.C.-D.C.	For welding Inconel to steel
Submerged Melt	"52" Inconel Wire	For welding Inconel
Inert Gas Metal-Arc	"62" Inconel Wire	For welding Inconel

70/30 COPPER-NICKEL

Oxy-Acetylene	"47" 70/30 Copper-Nickel Gas Welding Wire	For welding 70/30 Copper-Nickel using INCO "1" Gas Welding and Brazing Flux
Metal-Arc	"137" 70/30 Copper-Nickel Welding Electrode D.C.	For welding 70/30 Copper-Nickel
Submerged Melt	"57" 70/30 Copper-Nickel Wire	For welding 70/30 Copper-Nickel

"K" MONEL

Oxy-Acetylene	"44" "K" Monel Gas Welding Wire	For welding "K"* Monel, using 2 parts INCO "2" Gas Welding Flux and 1 part Lithium Fluoride
Metal-Arc	"134" "K" Monel Welding Electrode D.C.	For welding "K" Monel
Inert Gas Metal-Arc	"64" "K" Monel Wire	For welding "K" Monel

LUKENS

NICKEL-CLAD STEEL

Metal-Arc	"131" Nickel Welding Electrode D.C.	For welding Nickel side only

"L" NICKEL-CLAD STEEL

Metal-Arc	"131" Nickel Welding Electrode D.C.	For welding "L"* Nickel side only

MONEL-CLAD STEEL

Metal-Arc	"140" Monel Welding Electrode D.C.	For welding Monel side only

INCONEL-CLAD STEEL

Metal-Arc	"133" 80/20 Nickel-Chromium Welding Electrode A.C.-D.C.	For welding Inconel side only

FLUXES

INCO "1" Gas Welding and Brazing Flux—For the welding and brazing of copper-nickel and other copper alloys.

INCO "2" Gas Welding Flux – For the welding of all stainless steels, rustless irons, Inconel and other chromium-containing alloys.

INCO "3" Gas Welding Flux—For the welding of Monel and other Nickel-copper alloys.

CAST IRON WELDING

Metal-Arc	NI-ROD* Electrode A.C.-D.C.	For machinable welds in cast iron
Metal-Arc	NI-ROD "55"* Electrode A.C.-D.C.	For welding cast iron of high phosphorus content and castings of heavy sections

*Reg. U. S. Pat. Off.

For further information, write for your copy of the catalogue: "INCO Welding Materials."

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TRADE MARK

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TIME & MONEY
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SPATTER-PROOF
COVER LENS
SAVE EYE STRAIN

THERMO KORNER-KLAMP
HOLDS 2 PIECES AT
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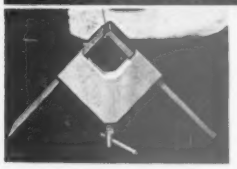

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THERMO Spiral
TIP CLEANERS
NEW SPIRAL DESIGN
GUARANTEED
UNBREAKABLE

THERMACOTE CO.
Newark, N. J. Chicago, Ill.
Los Angeles, Calif. Portland, Ore.

Welding Process Helps Rolled Gold Industry

GOLD CAN BE ROLLED to a mirror finish and as thin as electroplating on any nonferrous metal base by means of the "Inter-Weld" process developed by The American Silver Co., Inc., Flushing, N. Y. The new process, its owners claim, is an improvement on the so-called "Old Sheffield" process in which a layer of karat gold is silver soldered to a base metal. In the new "Inter-Weld" process, the gold layer is welded to a barrier layer of pure nickel and then this dual thickness is soldered to the base metal.

It has been found impossible in the past to manufacture mechanically plated karat gold rolled down to thicknesses approaching gold electroplate because of the tendency of the silver solder used in the "Old Sheffield" process to diffuse or "bleed" through the surface of the gold and present a mottled, streaked appearance. This "bleeding" is said to be overcome completely by welding the gold layer instead of soldering it and by the introduction of the barrier layer of nickel. Ratios as low as 1/600 have been achieved with a karat gold thickness of 9/1,000,000th in. and less.

* * *

Stud-Welding Cuts Construction Costs

COST savings ranging from 26 to 64% have been made in the installation of corrugated roofing and siding with stud-welded fasteners, according to the Nelson Stud Welding Division of Morton Gregory Corp., Lorain, O. This figure has been taken from cost records of contractors who have been using the automatic stud-welding method.

Throughout the summer, demonstrations are being staged in cities across the country displaying the various advantages of the process. So far, demonstrations have been held in New York and Chicago.

Such large savings, explains Leonard C. Barr, vice-president and general sales manager, are due to the ability of a four-man crew working from outside the structure to turn out an average of 25% more work than a five-man crew working with straps, clips and rivets, for which inside scaffolding is required.

In the case of steel roof decks, where a four-man crew is used in both tack-welded as well as stud-welded jobs, the increased ease of installation is said to enable the men to place 32 squares a day by stud welding instead of 18 by tack welding.

* * *

Resistance Welding Institute Moves Headquarters

OFFICES of the Resistance Welding Institute have been moved to the Hartman building, Warren Road at Detroit Ave., in Cleveland. The institute was formed this year by the Resistance Welder Manufacturers Association to be a clearing house for information on resistance welding processes. Director is Lee H. Judge.

NOW...
prompt deliveries on
WELDING
SUPPLIES

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FOR STEEL USERS

UNITED STATES STEEL SUPPLY COMPANY
USS
STEELS
SERVICE

Immediate shipments from stock can now be made on these types of Welding Rod for electric arc welding:

- Mild Steel Electrodes
- Stainless Steel Electrodes
- Hard-Surfacing Electrodes

And your orders for other welding supplies also can be filled quickly from our substantial warehouse stocks. Moreover, you are now assured prompt deliveries on Welding Machines, Protect-O-Metal (for eliminating weld spatter), and Havens Protected "C" Clamps. Call, wire or write our warehouse or sales office nearest you.

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CLEVELAND · LOS ANGELES · MILWAUKEE
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Also Sales Offices At: KANSAS CITY · PHILADELPHIA
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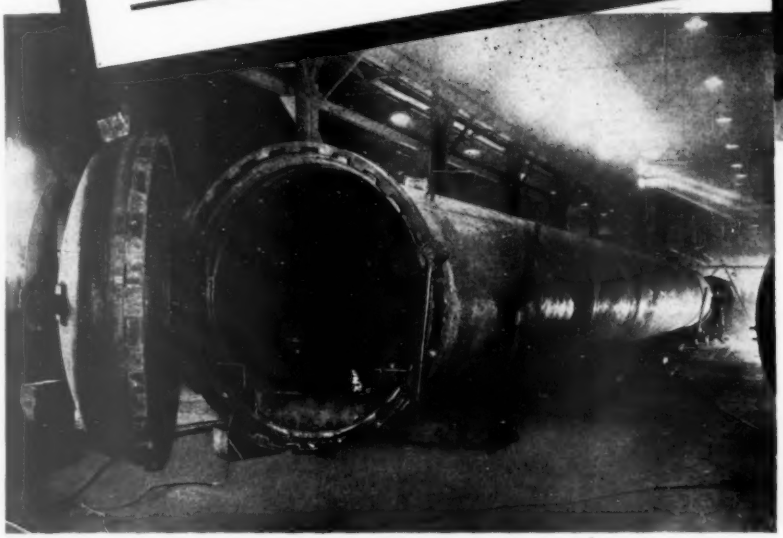
USS
Headquarters Offices
208 S. La Salle St. Chicago 4, Illinois

UNITED STATES STEEL

Production Up 50%
Labor Costs Down 50%
OUR CLAIM . . .
PROVEN BY OUR CUSTOMERS



PRODUCTION UP AT BLACK, SIVALLS & BRYSON, INC., KANSAS CITY, MO.

"The Worthington-Ransome turning rolls shown in the picture permit efficiency on repetitive work up to 90% and better—based on accurately measured arc-time. This might compare with 10 to 15% efficiency *without* the turning rolls."

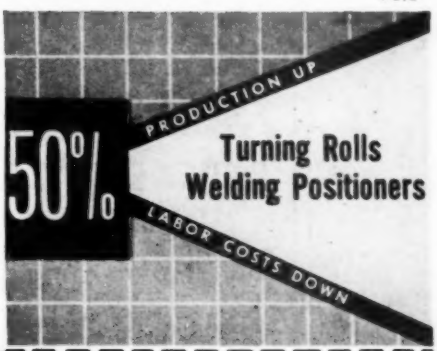
LABOR COSTS DOWN 50% AT DALLAS TANK COMPANY, DALLAS, TEXAS

"The savings resulting from the use of Worthington-Ransome turning rolls result in a reduced labor cost of approximately 50% over hand methods. We have found your equipment to be entirely satisfactory and to give long maintenance-free service."

Time saved when Worthington-Ransome Turning Rolls "handle" the work for you means *more arc time* per day. All welds are made in the "down hand" position with heavier electrodes for neater, better welds.

The improved Worthington-Ransome line includes three models, with standard capacities from 3 to 75 tons, up to 14 feet in diameter, stationary or self-propelled. (Rolls for heavier or larger work also available.) Also: positioners with capacities from 100 lbs to 20 tons.

Y 9.4



WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION

Welding and Assembly Positioning Equipment Division

DUNELLEN, NEW JERSEY

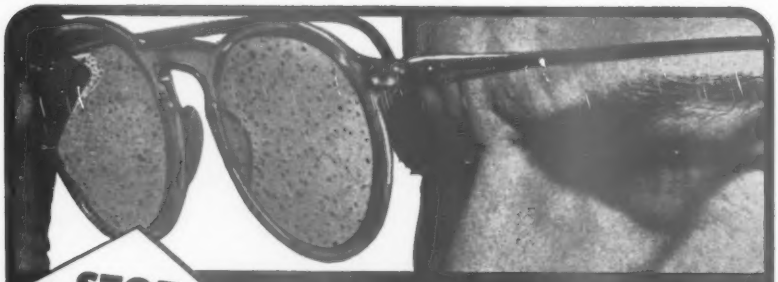
Worthington Pump and Machinery Corp.
Dunellen, N. J.

Please send Bulletin 228 on Worthington-Ransome Turning Rolls.

NAME .....

COMPANY .....

ADDRESS .....



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We grind and treat prescription lenses too. **TUF-COTE will leave them optically perfect, even clearer than before. For replacements order Wallace Eyeguard prescription glasses, TUF-COTE treated.**

List of representatives sent on request.

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NATIONAL CARBIDE CORPORATION

60 E. 42nd St., New York 17, N. Y.

New Pipe Mill At McKeesport, Pa.

THE National Tube Co. will construct a new resistance-welded steel pipe mill at National Works in McKeesport, Pa., it was announced recently. The new facilities will provide for an annual capacity of 100,000 net tons of 26-in. and larger diameter welded and expanded steel pipe. Pipe will be produced in 40-foot lengths.

Construction of the mill will start immediately, and production of pipe is expected to begin by March, 1950. Prior to the war, welded piping was produced in the McKeesport area but the equipment was replaced with facilities for producing ordnance material.

* * *

Illinois Tech Dedicates Two New Buildings

A new chemistry building and a new metallurgical and chemical engineering building on the campus of the Illinois Institute of Technology, Chicago, were formally dedicated on June 17.

The day's activities started at 9 a. m. with registration of guests and an inspection of the new structures. Two lectures were given at 10 and 11 a. m., respectively, on chemical and metallurgical topics.

Speaker at the dedication luncheon was James A. Rafferty, vice-president, Union Carbide and Carbon Corp. Praising the rapid advance of technology in the United States through such schools as Illinois Tech, Mr. Rafferty said that a major source of American strength is in such education.

Lectures in the afternoon were presented by James B. Austin, director of research, United States Steel Corp., who spoke on "The Blast Furnace Process: An Example of Applied Chemistry and Metallurgy," and George G. Brown, professor of chemical engineering at the University of Michigan, who discussed "Chemical Engineering at the Crossroads."

* * *

Courtesy General Electric Co.

HULL SUBASSEMBLY for ship is held for welding at Mississippi Valley Structural Steel Company plant, Melrose Park, Ill.

MAKE BETTER OPERATORS!

Write for CATALOG 48

Gives details on full line of K-G Welding Torches, Cutting Torches, Tips, Regulators, Adaptors, etc.

Give Your men the BEST!

JUST a few minutes welding or cutting with K-G equipment and your operators know they have *real* tools . . . fast-working, well-balanced, accurate, easily controlled. You can't beat the combination of skilled operators, plus fine tools, to turn out better, faster gas welding and cutting.

K-G Welding Torches, Cutting Torches and Gas Regulators are scientifically designed and built on the experience of 35 years of specialization in the manufacture of gas welding and cutting equipment. Every proven advance in metallurgy has been adopted to insure durable service. And to assure safety, all items carry the Underwriters' Laboratories approval.

Next time, say "K-G" when ordering torches or regulators. You'll find there's a difference. Buy from your local distributor.

Since 1914, manufacturers of quality welding and cutting equipment

K-G

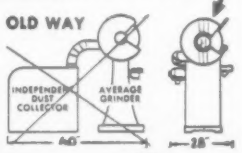
WELDING AND CUTTING COMPANY, Inc.
515 West 29th St., New York 1, N. Y.

Sold in Canada under the name "WELDCO"
by Welding and Supplies Co., Ltd., Montreal and Toronto

A UNIT OF Air Products INC. OXYGEN GENERATING EQUIPMENT

K-G . . . for 35 years, symbol of satisfaction on GAS WELDING AND CUTTING EQUIPMENT

"BUILT-IN FEATURE"
SAVE OVER 50% FLOOR
SPACE THE HAMMOND WAY



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Below—REAR VIEW

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Exclusive OXO features

- Protected Gauges
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- Built-in Check Shock
- Stainless Micro Filter
- Only one size socket wrench necessary to effect complete change of working parts

Underwriters Laboratories Approved

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International Welding Institute Held Holland Conference

SECOND annual congress of the International Welding Institute was held at Delft, Holland, at the Technical University in May. Foreign delegates numbered 160 and were welcomed by P. Goldschmidt, president of the Institute, and Ir. G. de Rooy. The Nederlandse Vereniging voor Lastechniek, hosts to the Congress, arranged an evening boat trip through the canals of Amsterdam and also a visit to Philips Electrical Works at Eindhoven.

The proceedings consisted principally of meetings of the twelve commissions on various phases of welding which had been set up at the Congress last year. The governing council, which consists of 3 representatives from each country, also met and among other matters agreed upon applications for membership in the institute received from Canada and a technical association in Austria.

Program discussed by the commission on arc welding was directed toward establishing international standards for measurement of current and voltage consumption when testing electrodes. A small sub-committeee was formed under the chairmanship of B. Kjellberg of Sweden to examine the standards in use in the various countries and to draw up a suggestioned international classification system.

The commission on gas welding agreed that more research and international cooperation are necessary on powder cutting, improvement in filler metal and development of cutting torches, particularly as to their general economy.

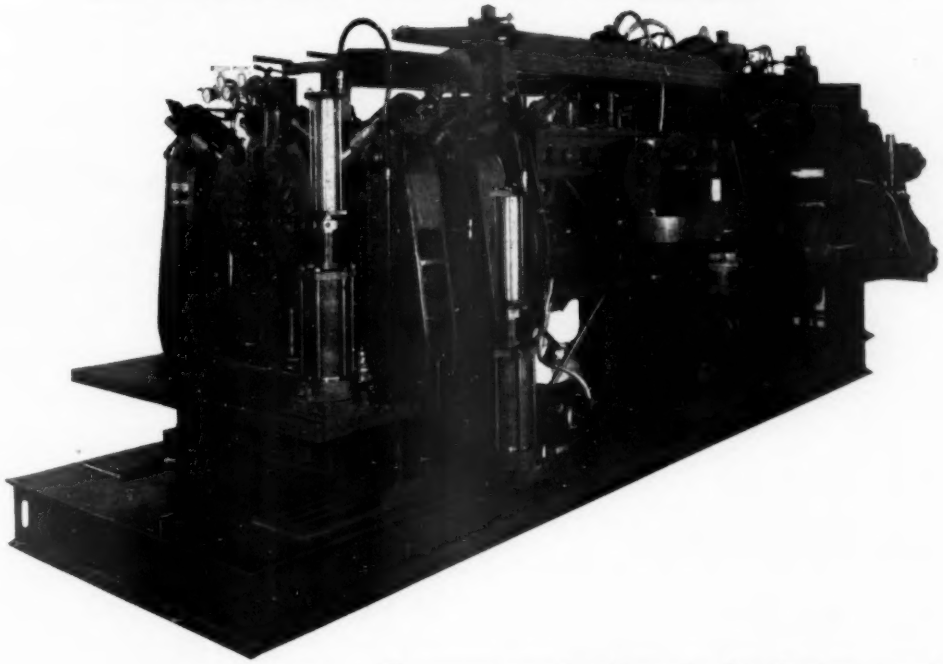
Many countries are giving considerable time to fatigue testing of welded specimens and full scale welded structures. Since there is a serious shortage of fatigue testing machines of 100 tons capacity, it is desirable to co-ordinate the work being undertaken in various countries to best utilize those machines available.

Much interest was expressed by delegates in welded ship fabrication. An attempt will be made to collate information on: the sequence of welding in prefabricated sections for cargo, cargo-passenger and tanker vessels; form and size of prefabricated sections and information on accidents or failures in welded ships.

The commission on resistance welding agreed that the first aim should be to secure international standards for the classification of resistance welding methods and machines and definitions of the terms used. A discussion was held on the British and American formulas for tip diameters. Delegates noted that both give the same results for thicknesses up to ⅝ in., but beyond that the American formula gives too large a tip, especially for heavy sheets, and the English formula too small a tip. The Belgians have evolved an empirical formula which is said to fall between the other two.

In March the commission on documentation published a system for classifying technical welding documents. The first issue of the International Institute's Bibliographical Welding Bulletin containing abstracts and classifications of studies has also been issued.

STAYING OUT OF THE GROOVE IS OUR BUSINESS!



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- Turning Rolls
- Universal Jib Welder

Because our business is the design, engineering and manufacture of special jigs and fixtures, we can't afford to "get in the groove."

No two Penn Tool & Machine Co. products are alike because each of our customers has a unique requirement—a special problem to be met and solved by a welding jig or fixture.

But no matter how different one Penn Tool & Machine Co. product is from another, they all have the same sound design, practical engineering and superior operating efficiency that has characterized Penn products for many years.

If your production requires the welding of repetitive parts and your costs must be kept to a minimum, bring your problem to us. Our engineering skill, experience and modern plant facilities are at your disposal.

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An affiliate of THE BERKELEY EQUIPMENT CO.

DANVILLE ILLINOIS

13% MORE WELDS PER INCH OF ROD WITH

SPEER
CARBON ELECTRODES

Uniform composition of Speer Carbon Electrodes provides even, steady burning, with maximum heat and penetration at welding point. High current carrying capacity plus exceptional stability, means less spluttering and spindling waste ... 13% more welds per inch of rod.

This smooth burning develops a better point, as well, concentrating the arc for hotter, more uniform welds.

4 ELECTRODE GRADES AVAILABLE IN STANDARD SIZES

For D.C. Welding

Speer Carbon Rods—Standard grade, hard and strong to last long when current density requirements are normal.

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Speer ACWeld Electrodes—Plain, or copper-coated for better carrying capacity and burning qualities when current is high.

And be sure of best results, use Speer Welding Plates, readily cut or shaped to any desired shape or form, and Speer Welding Paste, a superior fire-resistant paste, easy to mold.

Write for bulletin listing available Speer Electrode sizes.

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Welding Classes Cancelled By VA at Cleveland School

TRAINING of more than 100 G.I. welding students was discontinued recently at the Cleveland School of Welding, Cleveland, O., because of the expiration of a contract with the Veterans Administration. President of the school, Edward T. Scott, said that the contract was not renewed because the VA had tried to limit his salary in negotiating new terms.

Joseph E. Hanratty, of the VA Cleveland office, said that the school had sought an increase in its hourly student rate from 90 to 95 cents and that Mr. Scott had listed an increase in his personal salary from $15,000 to $18,000 a year in cost data submitted to the VA.

The Cleveland office was not authorized to consider any amount in excess of the rate of $10,000 per year for all duties, including teaching and administration, for any individual who has a proprietary or bonus interest in the institution.

The original contract had been granted because G.I. students were in training there before the contract was negotiated. All students whose training was stopped will be given other opportunities to finish their classes, according to the educational chief at VA's Cleveland office.

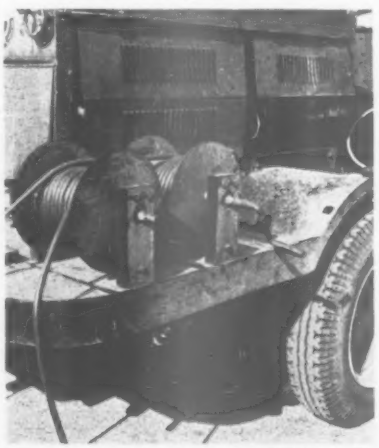
* * *

Powder Cutting Shortens Oil Refinery Column

POWDER-CUTTING solved a difficult problem in refinery construction at a midwest refinery. The inner chamber of a large 5-story catalyst tower proved to be 3 1/2 in. too long. It was made of 12% chrome steel, 1-in. thick. As well as shortening the column, it was also necessary to cut eight circles in the inner chamber to allow heat to pass into the outer chamber.

In all, some 70 ft of chrome steel were cut. The entire tower was stress relieved in position, and the holes were welded back after treatment. By means of the powder-cutting process, using an iron-rich powder blown into the oxygen stream, the job was done in only two days.

* * *



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WELDING CABLE spools fabricated from sheet steel save time and money, keep cable unkinked. Spools are mounted on a shaft between lengths of wooden uprights faced with steel. Crank winds cable quickly

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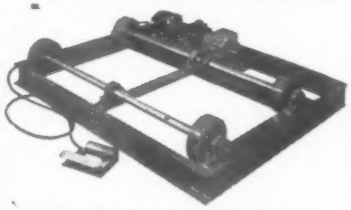
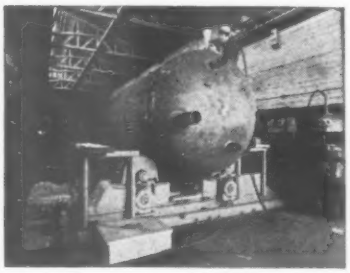
YOU'LL WELD 'EM AT LESS COST IF YOU USE

REED ENGINEERED TURNING ROLLS

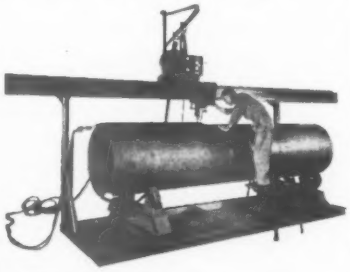
THE ONLY COMPLETE LINE OF MODERN TANK WELDING EQUIPMENT



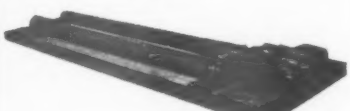
★ THE NEW RD-20 TURNING ROLL
Cap. 2,000 lbs.—handles up to 6 ft. x 12 ft. tanks.
Priced at $650.00 F.O.B. Factory.
Described in Bulletin No. 70.



★ HEAVY DUTY TURNING ROLLS
Built in 5 standard sizes—3 ton, 6 ton, 12½ ton, 25 ton and 50 ton.
Complete details shown in Bulletin No. 68.



★ UNIT TYPE FOR AUTOMATIC WELDING
Combines Turning Rolls and Track Support into one compact unit.
Made in 5 standard sizes—
Special units made to order.



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For accurate fit-up, assembly and welding.
Both standard and special units built to your requirements.

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McGraw-Hill Magazines To Be Microfilmed

THE McGraw-Hill Publishing Co., New York City 18, has entered into an agreement with University Microfilms, Ann Arbor, Mich., to make available to libraries issues of a number of McGraw-Hill publications in microfilm form. THE WELDING ENGINEER is included in these publications.

The microfilm will make it possible to produce and distribute copies of the magazines on the basis of an entire volume in a single roll, in editions of 30 or more, at a cost approximately equal to the cost of binding the same material in a conventional library binding.

Under the plan, the library keeps the printed issues unbound and circulates them in that form for two to three years. When the paper copies begin to wear out or are not called for frequently, they are disposed of and the microfilm is substituted.

Sales are restricted to those subscribing to the paper edition, and the film copy is only distributed at the end of the volume year.

Inquiries concerning purchase should be directed to University Microfilms, 313 N. First St., Ann Arbor, Mich.

* * *

Kaiser Steel to Produce Resistance-Welded Piping

KAISER STEEL Corp. and Basalt Rock Co. have announced completion of a manufacturing and sales agreement which will increase west coast production of resistance-welded steel pipe. Facilities will be added to the Napa, Calif., plant of Basalt to increase production in the sizes currently fabricated from 8⅝ to 20 in. and to allow manufacture of new pipe sizes up to 36 in. The pipe will be produced in 40-ft lengths to meet ASTM and API standard specifications.

Plate for the pipe will be supplied from the Kaiser Steel mill at Fontana, and the Kaiser Steel sales organization will market the product as "Basalt-Kaiser" pipe.

* * *

IAA Members Discuss Navy Cutting Torches

MEMBERS of the International Acetylene Association met recently with Navy personnel at the New York Naval Shipyard, Brooklyn, to review plans for the proposed Navy standard cutting torch and tips. The conferees agreed that duplicate "mock-up" torches should be fabricated prior to manufacture of the prototype torches for field service tests. The Victor Equipment Co., San Francisco, will manufacture the "mock-up" torches.

* * *

Columbus, O., Concern Named Lincoln Distributor

LINCOLN ELECTRIC Co., Cleveland, has appointed Permacrete Products Co., Columbus, O., as local distributor for the Lincoln line of arc welding equipment, electrodes and other welding supplies.

When good eye protection . . .

is no good at all!

This is a common sight in many plants—a condition that contributes to top-heavy accident rates, compensation costs and to lags in production.

Cover-All* Goggle Style CC60

Wearing comfort, more than anything else, will move safety goggles off the forehead on to the eyes. In Cover-All* goggles, as in all WILLSON protective equipment, comfort plays a big part in their design. The large, deep eyecups allow plenty of room for wearing prescription spectacles—and they are molded with rolled edges to fit facial contours around the eyes. The soft, leather bridge adjusts to the correct distance between the eyes and the adjustable headband provides for proper head size.

Don't fail to consider personal comfort if you want eye safety equipment worn as intended.

WILLSON*

"Established 1870"

DAILY REMINDERS

Such as Willson "Blind Man" safety posters keep workers in hundreds of plants aware of the need for personal safety measures. Supplies are available on request.

*Reg. U.S. Pat. Off.

WILLSON PRODUCTS, INC., 227 WASHINGTON STREET, READING, PA.

BOOKS for the WELDOR

Written to be read and understood.

THE WELDING ENCYCLOPEDIA

By T. B. JEFFERSON

• The complete story of welding, from A to Z, Abrasion through Zirconium. Every fact, every rule, every bit of guidance needed in selecting right materials for any welding job—are all available in this one volume.

It contains 1398 charts, illustrations and figures—274 tables—16 valuable data sheets—90 pages of trade names—all in over 1000 pages. The twelfth edition is now ready. **$6.50 per copy**

THE OXY-ACETYLENE WELDOR'S HANDBOOK

By T. B. JEFFERSON

• For those who are desirous of adding to their storehouse of knowledge on oxy-acetylene welding, this book is just the thing. It describes this particular type of welding explicitly—and to date it has proven quite valuable to those using it.

Revised, enlarged and brought up to date, this 4th Edition is the most complete volume released giving weldors 264 pages of data specifically on oxy-acetylene welding. **$2.50 per copy**

WELDING-Its Questions and Answers

By T. B. JEFFERSON

• This completely illustrated volume contains 500 questions, each answered clearly and understandably. It answers those questions foremost in the minds of—and those most frequently asked by—weldors about welding, cutting, materials, flame treating, inspecting, etc.

By using the handy index, the answer to any question regarding welding—for both the novice and expert alike—can be found on one of the 176 profusely illustrated pages. **$1.50 per copy**

WELDING DESIGN HANDBOOK

• Seven chapters containing complete data for those actively engaged in welding design. A large section specifically devoted to a consideration of the basic design problems. In addition, single pages of data are included, grouped to give pertinent information on welding processes, weld joints and stresses, welded design, cost, materials, pipe data and engineering tables. **$1.50 per copy**

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- ☐ WELDING—ITS QUESTIONS and ANSWERS *$1.50 per copy*
- ☐ WELDING DESIGN HANDBOOK *$1.50 per copy*

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Company .....

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USE THIS COUPON WHEN ORDERING THESE HELPFUL BOOKS

Iron and Steel Men Meet in Pittsburgh

PITTSBURGH, appropriately enough, will be the scene of the 1949 annual convention of the Association of Iron and Steel Engineers, who will meet at the William Penn hotel, October 3 to 6 inclusive. Over 3,000 engineers and steel mill operators are expected to attend.

The program embraces some 40 technical papers and two inspection trips: to the Irvin works of the Carnegie-Illinois Steel Corp. at Dravosburg, Pa., and to the Aliquippa, Pa., works of Jones and Laughlin Steel Corp.

* * *

Tin Research Institute Formed at Columbus, O.

DEVOTED to providing free technical service to tin consumers in the United States, Tin Research Institute, Inc., has opened offices at 492 West Sixth Ave., Columbus 1, O. A sponsorship will be maintained at Battelle Memorial Institute, Columbus, to handle new researches.

Technical experts are available for consultation and practical assistance either at the Tin Research Institute or at the consumers' plants. A wide range of free publications covering every important use of tin is available.

Robert J. Nekervis has been appointed supervisor of metallurgical development and Robert M. MacIntosh has been appointed supervisor of chemical development in the new corporation.

* * *

National Safety Congress Scheduled for Oct. 24-28

THIS YEAR'S National Safety Congress and Exposition will be held in Chicago October 24-28. Nearly 12,000 persons are expected to attend from the United States, Canada and other parts of the world. Among speakers scheduled to appear on the program are: Gustav Metzman, president of The New York Central System; James Tanham, vice-president for industrial and public relations of The Texas Co., and chairman of the board of the National Safety Council; James E. Trainer, vice-president of Firestone Tire and Rubber Co., and Earl E. Moore, vice-president for industrial relations of Carnegie-Illinois Steel Corp.

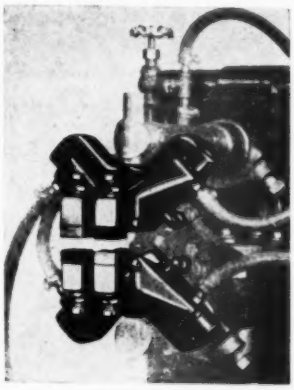
* * *

Improper Use of Press Breaks Weldor's Ribs

A RECENT industrial accident involved a weldor who was breaking up scrap lumber in a flange press to provide fuel for a small heating stove. He carelessly placed the end of a long board in the press which when operated swung the opposite end of the board around to strike him on the left side. He sustained a laceration over the left eye, contusion of the left ribs and fractures of the left 7th and 8th ribs.

Using equipment only for its intended purpose will prevent many a costly and crippling accident.

. . . . MAKE YOUR SPOT WELDER
A BUTT WELDER IN 2 MINUTES
SIMPLE • INEXPENSIVE



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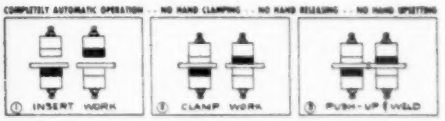
AUTOMATIC BUTT WELDING ATTACHMENT


COMPLETELY AUTOMATIC OPERATION . . . NO HAND CLAMPING . . . NO HAND RELEASING . . . NO HAND UPSETTING
1 INSERT WORK
2 CLAMP WORK
3 PUSH-UP TO WELD

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USERS
DISTRIBUTORS
Write today for information on this time-saving, money-saving attachment.

★ The Hoffman Butt-On-Spot Attachment is a water-cooled completely automatic butt welding attachment designed to fit any spot welder having a minimum horn clearance of 7"—manual, air operated, or motor driven.
Maximum capacity dependent on welder KVA capacity but recommended maximum is ⅝" dia. round stock, 5/16" square stock, and ¼"x⅝" rectangular stock.

ROBERT W. HOFFMAN CO., INC.
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Removes HARMFUL FUMES ON-THE-JOB
—with no connection to outside air!

The M·S·A
Welding Fume Exhauster

Here is a complete and compact unit for removing welding fumes from the air of confined spaces—so simple that any welder can employ it without assistance in setting up. Assures safe clean atmosphere, protecting the health of workers and promoting increased production. Scientific in principle—practical in operation—requires no hoods, fixtures, or connection to ventilating ducts.

- SELF-CONTAINED
- LIGHTWEIGHT
- COMPACT
- SIMPLE TO USE
- EASY TO MAINTAIN

Write for complete construction and operating details on this outstanding new M.S.A. development—request descriptive Bulletin No. CU-1.

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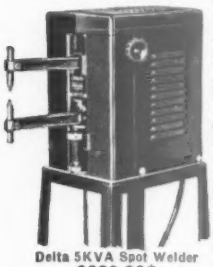
Tells you about a new welder that spot welds, arc welds, brazes, and solders! It's the Delta "Dual-Weld" Combination Welder. There's no other welder like it! It combines a 5KVA spot welder and 120-ampere arc welder — and costs much less than separate units.



Delta 5KVA Spot Welder
$228.00*
as shown.

Tells you about the new Delta 5KVA Spot Welder that spot welds fine wire as efficiently as 16-gauge steel, without burning or overheating — on a production basis.

Tells you about the new Delta 120-Ampere Portable Arc Welder — a light-duty, limited-input, transformer-type welder.

Keep posted on the newest developments in welding. Send for Bulletin AD-453 now!

*Prices subject to change without notice.

Delta 120-Ampere
Portable Arc Welder
$141.75*
as shown,
with helmet

POWER TOOL DIVISION
Rockwell Manufacturing Co.
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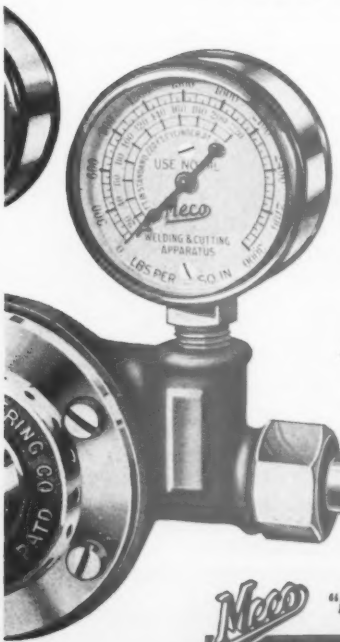
Safer... at no added cost



Meco
Safe-T-Chek
REGULATORS

The MECO Safe-T-Chek is the only regulator with a *built-in*, self-actuating safety valve that controls excessive pressures due to careless handling or failure of seating. This *built-in* safety feature comes to you at no additional cost. See your MECO Dealer TODAY.

FREE—Write for your copy of the NEW MECO Catalog No. 140 TODAY.

Meco "Always specify MECO... the finest in the field"

Modern Engineering CO., Inc.

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Commerce Secretary to Speak at Chicago Time Study Clinic

SECRETARY OF COMMERCE Charles Sawyer will head a group of nationally prominent leaders of labor, management and government who will view the prospect of the present economic outlook at the 13th annual Time and Motion Study Clinic, to be held at the Sheraton Hotel, Chicago, Nov. 2-4, under sponsorship of the Industrial Management Society. The clinic is expected to bring together more than 4,000 industrial executives, plant operators and supervisors.

Ralph H. Landes, Western Electric Co., is general conference chairman, and William S. Wheeler, western editor of *Factory Management and Maintenance*, a McGraw-Hill publication, is program chairman.

* * *

Welded Ship Sails 18,000 Mile Goodwill Tour

THE motorship *Seattle*, recently built for the Johnson Line, visited New York this year on a goodwill tour of 18,000 miles. Hull of the ship is all-welded and reinforced to permit the ship to be dry-docked with at least 2,000 tons of cargo in the holds.

As fast as any freighter in the world, the *Seattle* has a cruising speed of 20 knots. Overall length is 502 ft, beam 64 ft and deadweight tonnage, 9,100. Engines are double-acting Diesels with a combined rating of 14,000 ihp at 110 rpm.

A combination cargo-freight vessel, the ship has seven hatches and fourteen cranes for fast loading and discharging of cargo. Passenger accommodations for twelve are included in four single and three double cabins.

* * *

Linde Plant Commences Full-Scale Operations

A RECENTLY completed oxygen distributing station and acetylene producing plant at Fargo, N. D., began operations in June for the Linde Air Products Co. The new facilities are at the corner of Seventh Ave. North and 22nd St. North and cover five acres. A spur of the Great Northern Railway serves the plant.

* * *

EYE-CATCHING sign brings in business for Los Angeles welding and blacksmith shop

Westinghouse Receives Big French Mill Order

SOLLAC (Societé Lorraine de Laminage Continu), a privately owned association of nine French steel firms, has placed an order for $9,500,000 worth of electrical steel mill equipment with the Westinghouse Electric International Co., New York City.

The equipment is to be installed in two new steel mills at Hayange and Ebange, neighboring towns in the iron-ore-producing Moselle sector of northeast France. When completed, these mills will process a minimum of 850,000 tons of raw steel annually into sheet steel and tin plate.

* * *

Mars Co., Duluth, Takes on Ampco Line

THE COMPLETE line of Ampco welding electrodes will be distributed by the W. P. and R. S. Mars Co., 322 West Michigan St., Duluth, Minn. Mars covers a territory including northern Minnesota, upper peninsula of Michigan and the northern counties of Wisconsin.

* * *

Retay Welding Company Opens New Building

RETAY WELDING Co., Lorain, O., was expected to open its new building on Oct. 1, according to Anthony Retay, president. The one-story structure will contain a front show room, a shop and an office to handle the fabricated railings and ornamental iron products produced by this company.

* * *

Ohio Companies Merge to Form Welding Concern

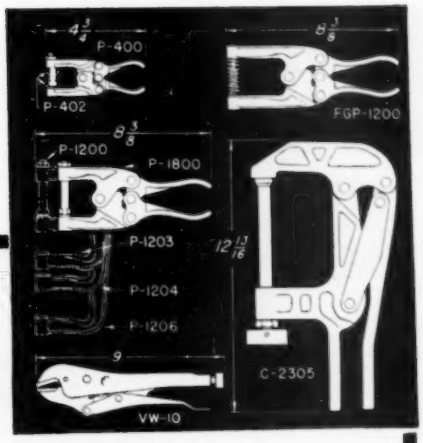
WELDING EQUIPMENT & Mill Supply Co. and The Thomas Home Gas Co., Galion, O., have merged into a newly incorporated company, Thomas Gas & Welding Supply Co. The incorporation was made in preparation for an expansion program in the sale of welding gases, welding equipment and bottled gas for home, medical and industrial uses. With the enlargement of present propane storage facilities, the firm will enlarge its sales territory.

* * *

Metals Processing Lab Endowed by Alfred P. Sloan, Jr.

A GIFT of $1,000,000 from Alfred P. Sloan, Jr., chairman of the board of General Motors Corp., has been received by the Massachusetts Institute of Technology for construction of a metal processing laboratory.

In expressing M. I. T.'s apprecation to Mr. Sloan, Dr. James R. Killian, Jr., president of the school, said: "The new laboratory, which is to be named for Mr. Sloan, will enrich and extend the institute's entire engineering program. It represents a pioneer effort on the part of the institute to combine in an educational and research program the metallurgical and mechanical engineering approach to the fabrication of materials."



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Save time — speed production.

Lock work securely and quickly and release it instantly. Pressure is pre-set.

Fixed mounted and portable types; cylinders.

Weld-spatter-resistant copper spindles available upon request.

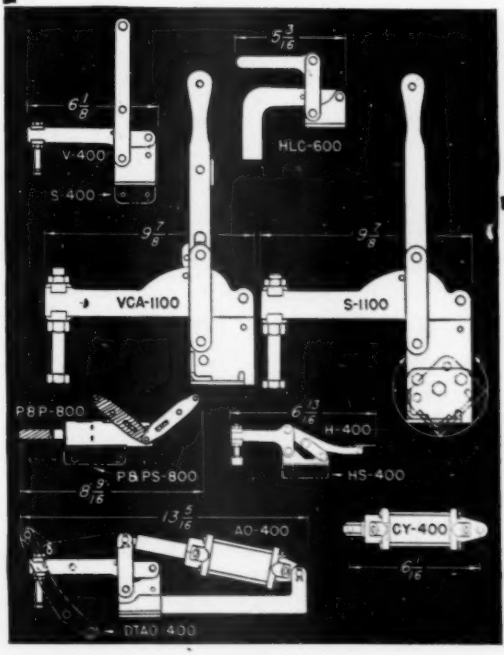
Manual or air-operated types for remote control or multiple installations.

Toggle and cam-action types.

Heat treated for long life and rugged usage.

Parts individually cadmium plated for rust resistance. Many sizes; capacities from 200-3000 lbs.; special types upon request.

(All illustrations shown in this ad approximately ⅛ size.)



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For HIGH TENSILE STRENGTH, MACHINABLE WELDS

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PLAIN AND ALLOY CAST IRON

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ELECTRODES • MOLY RODS

- Perfect Color Match
- Like Expansion and Contraction

Cast Welding Rods

CAST ALUMINUM RODS & FLUXES

THE CHICAGO HARDWARE FOUNDRY CO.

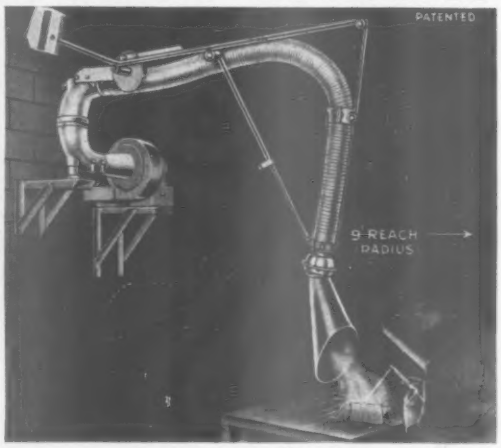
"Dependable Since 1897"

20109 Commonwealth Ave. NORTH CHICAGO, ILLINOIS

RUEMELIN Fume Collector

(Above) Welding without ventilating snout. Note smoke clouds and poor vision. Gases and heat surround operator's helmet.

(Right) Collecting fumes with a Ruemelin Fume Collector.



REMOVES WELDING FUMES *at the Source!*

Solve your welding fume problem efficiently by installing Ruemelin Welding Fume Collectors. They produce a powerful suction that removes smoke, gas and heat at the source. Guards employee health, resulting in less welder fatigue. Clears shop air with minimum heat loss. Covers maximum welding area vertically, horizontally and by circle swing. Made in 9 ft. and 15 ft. reach sizes. Shipped assembled, easy to install. Thousands in practical service. Free engineering service for your installation.

Write for our New Bulletin 37-D and list of users — just off the press.

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS

SAND BLAST AND DUST COLLECTING EQUIPMENT

3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

Industrial Air Products Completes Southern Plant

TO SERVE THE STATES of Mississippi, Louisiana, Florida and Alabama, the Industrial Air Products Co. recently completed an oxygen and acetylene plant in Pascagoula, Miss. Capacity is 6,000,000 cu ft of oxygen and 2,000,000 cu ft of acetylene per month. The plant is under the direction of G. H. Jeudevine.

The company has also completed an acetylene cylinder factory in Portland, Ore., where its home office is located.

• • •

New Welding Distributor at Youngstown, Ohio

FINDLEY Welding Supply Co., Youngstown, O., has been recently incorporated. It will deal in all types of welding equipment, tools and supplies.

• • •

Organize Welding Firm at Galion, O.

WELDING AND TOOL Supply Co., a new firm located at Galion, O., has been chartered to manufacture and deal in welding supplies.

• • •

About People

W. A. BROWN, JR., has been elected president and general manager of the Liquid Carbonic Corp. with headquarters in Chicago. He was formerly vice-president of the compressed gas division at New York. J. H. PRATT, formerly executive vice-president, has been appointed chairman of the finance committee of the board of directors. R. C. HOLBROOK, president and a director of the Liquid Carbonic Canadian Corporation, was elected a director of the Chicago corporation to succeed C. G. CARTER, retired.

• • •

DR. EDGAR C. BAIN, vice-president, Carnegie-Illinois Steel Co., will receive the 1949 Gold Medal of the American Society for Metals. Presentation will be made to Dr. Bain at the annual dinner of the ASM to be held at Cleveland's Hotel Statler on Oct. 20.

• • •

VERNE W. BENDER has been appointed manager of distributor sales for the Nelson Stud Welding Division of Morton Gregory Corp., Lorain, O. Mr. Bender will have his headquarters in San Francisco.

• • •

EDWARD R. ANDERSON has been appointed vice-president of the Kellogg Division of American Brake Shoe Co. He is located in San Francisco.

JOHN H. FAUNCE, JR., for the last three years district manager of sales at the Chicago office of Lukens Steel Co., Coatesville, Pa., has been named manager of sales promotion with headquarters in Coatesville. Prior to World War II, Faunce was associated with Armco Steel Corp., Middletown, O., for five years, serving respectively as manager of industrial markets and as manager of development engineering. He left Armco for service with the U. S. Navy, at the conclusion of which he was released as a lieutenant commander.

* * *

FRANK J. ASCHENBRENNER and EARL C. CLARK have been appointed assistant directors of research and engineering at Air Reduction. As a result of the transfer of the technical relations department from research and engineering to the secretary's department, JOHN J. CROWE, assistant vice-president and manager of technical relations, will report to J. D. GUNTHER, secretary. Mr. Aschenbrenner will be in charge of the Air Reduction Murray Hill, N. J., laboratory. H. O. KLINKE has been named assistant manager of the apparatus research division, and J. T. MCKNIGHT is the new superintendent of production and services section. T. J. CHOLIS becomes supervisor of patent section. Mr. Clark is in charge of development groups. J. K. HAMILTON, manager of apparatus research division, and DR. G. B. CARPENTER, manager of chemical research division, will report to Mr. Aschenbrenner. F. P. MCKEGNEY, chief engineer, W. WILKINSON, manager of liquefaction division, and C. J. MCFARLIN, manager of process engineering division, will report to Mr. Clark. DR. L. I. GILBERTSON has been appointed administrative manager in charge of business management, and L. M. VON WANCKEL as executive accountant. FREDERICK C. SAACKE has been appointed safety engineer of the Air Reduction organization. He will also assist Mr. Crowe in technical relations.

* * *

W. E. MAHIN, chairman of metals research at Armour Research Foundation of Illinois Institute of Technology, has been named director of research. He will head a group of 411 scientists, engineers, and technicians who are at present working on 125 active research projects for industrial and government sponsors.

* * *

GLENN E. JOHNSTON, of the sales development staff of Lukens Steel Company, Coatesville, Pa., has been transferred to the Chicago district sales office. He will replace Harry A. Dennis, who resigned.

* * *

BENJAMIN S. SAMPSON has been appointed manager of the Industrial Furnace & Oven Division of the Claud S. Gordon Company, Chicago.

* * *

W. J. HOWELL has been appointed assistant to Tomlinson Fort, manager of apparatus sales for the Westinghouse Electric Corporation.

INDEPENDENT Acetylene Cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Storage cylinders available in 12' and 20' lengths, of 850 and 1,500 cu. ft. capacities.

INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

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IMPORTANT
NEW USES
MEAN THAT YOU CAN
SAVE MONEY
WITH
3 in 1 "York's 77"
SPECIAL FLUX
FOR...
GENERAL BRAZING
CAST IRON WELDING
CAST IRON BRAZING

NO NEED TO STOCK
3 DIFFERENT FLUXES
WHICH DETERIORATE
WHEN ONE CAN OF
"York's 77" 3 in 1 FLUX
MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".
You will save money, save labor, and save time.

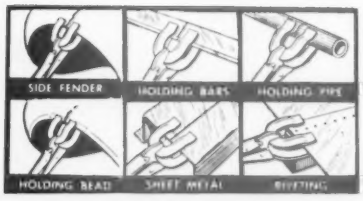
1 Fear of overheating can be forgotten.
2 Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.
3 Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.
4 Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY
3349 OGDEN AVENUE
CHICAGO 14, ILLINOIS

Just SEE What You Can Do
with the
VISE-GRIP
Welding Clamp

Locks
Parts in Alignment
FREES HANDS
for Welding

Simply (1) place the jaws over the parts to be welded—(2) close the toggle lever. This LOCKS the jaws to the work with powerful grip. The parts are held in alignment, securely—freeing both hands for handling the welding equipment. U-shaped jaws provide excellent visibility and working space for welding. Jaws adjust to 1-5/8". Made by makers of the famous VISE-GRIP Wrench. No. 9, 9", $2.95.



If not at your dealers, order direct.

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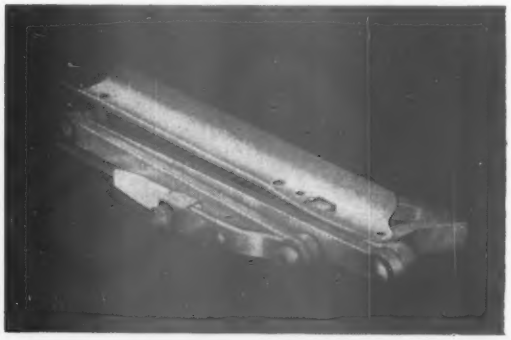

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TIME AND MONEY

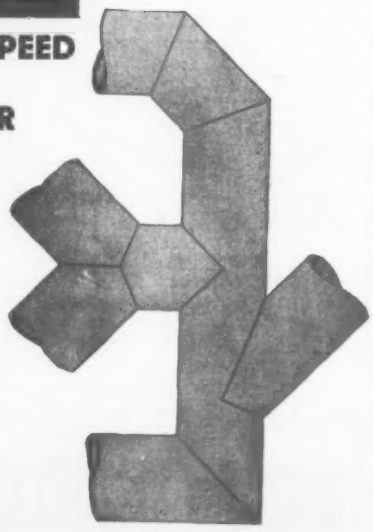
SPEEDY LAYOUT JOBS ON PIPE AND STRUCTURAL STEEL

NOW! NEW EASE AND SPEED
WITH THE
CONTOUR MARKER

Compact, fits into hip pocket. Efficient, accurate, easy to use. Any of the angles in the illustration to the right can be marked off in five minutes or less on any pipe from 1¼ to 18 inches. Saves time, labor and gas—will pay for itself in one day.

IF YOUR LOCAL DISTRIBUTOR CANNOT SUPPLY YOU CAN ORDER DIRECT.

See our booth No. 2531 at the Metal Show in Cleveland



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1043 E. Compton Blvd.
Compton, Calif.
Please send me full details on the Contour Marker.

NAME .....
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CITY .....

HENDLEY BLACKMON, managing editor of *Electrical World* since 1947, has been appointed assistant manager of engineering association activities for Westinghouse Electric Corp., East Pittsburgh. He will assist Frank Thornton, Jr., manager of engineering association activities, and work with Westinghouse engineers in the preparation of papers to be presented before engineering associations. Mr. Blackmon, a former Westinghouse man, was appointed manager of the company's technical press bureau in 1938, a position he held until 1945 when he resigned to join McGraw-Hill Publishing Co., Inc. He served successively as electrical editor of *Product Engineering*, managing editor of *Product Engineering* and managing editor of *Electrical World*.

* * *

OSCAR C. STARK, appointed general sales manager of Photoswitch, Incorporated, Cambridge, Mass. He was formerly associated with the Square D Company.

* * *

CLARENCE T. GILCHRIST has been named western area sales manager for American Steel and Wire Co. ROSWELL F. CURTIS was at the same time named eastern area sales manager at New York City and HOWARD B. MAGUIRE was appointed central area sales manager at Cleveland. Edward A. Murray will take the position of manager of the Chicago district sales office to replace Mr. Gilchrist.

* * *

DR. PAUL R. TRUMPLER, 35, has been appointed professor of mechanical engineering at Illinois Institute of Technology.

* * *

HUGO T. WILDER has been made manager of the marketing division of Aluminum Co. of America's sales department.

* * *

STANLEY J. RETZLAFF has rejoined Allis-Chalmers Manufacturing Co., Milwaukee, as manager of sales to machinery manufacturers.

* * *

MARTIN R. KING has been appointed manager of the General Electric Co.'s Apparatus Department News Bureau. Mr. King succeeds C. P. FISCHER, JR., who has been named manager of a new promotional division, activities of which will be announced later.

* * *

EARL ROBERTS has been appointed sales engineer with the Memphis branch of the Black & Decker Mfg. Co., Towson 4, Maryland. DAVID ROLSTON has joined the Black & Decker Co. and will be Home-Utility sales representative in Philadelphia.

* * *

J. W. BRAMLEY has been named manager of The Babcock & Wilcox Tube Co.'s new Boston district sales office. From 1937 to early 1949 he was with the Lincoln Electric Co. and J. E. Raney & Co. He is a past director of the Worcester, Mass., section of the American Welding Society.

The
KENT
SUCTION CLEANER
for
FLUX RECOVERY

Pays for itself by salvaging valuable flux!

This compact, easily portable machine can be adapted to any type of welding application.

The KENT SUCTION CLEANER

The Kent Suction for Flux Recovery picks up the unfused flux and small fused particles from the weld. The fused particles are automatically screened out of the flux and the fine dust is removed—clean flux is then deposited in the lower tank ready to be returned to the automatic welder as needed.

You're invited to visit the KENT Display
NATIONAL METAL EXPOSITION
AND CONGRESS
Oct. 17-21, 1949 Public Auditorium, Cleveland, O.
BOOTH 2844

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Book Reviews

Design

DESIGN FOR WELDING IN MECHANICAL ENGINEERING. By F. Koenigsberger. Published by Longmans, Green & Co., Inc., New York, 1948. Cloth, 5½x8½ in.; 210 pages, Price $4.50.

Coordination of theory and research results with experience gained in the design and manufacture of welded structures as used in mechanical engineering has been effected in this compact book of six chapters. While the author realizes that much is yet to be learned about welded steel construction, he stresses the theoretical and practical factors which might be of assistance to the designer.

Since the work in the drafting room is the basis for general production process, emphasis has been placed on correct drafting practices.

Design for Welding in Mechanical Engineering is a highly technical book, but the engineer with an understanding of higher mathematics will find many valuable suggestions between its covers.

* * *

Welding Fundamentals

ELEMENTARY AND APPLIED WELDING. By H. P. Rigsby and H. C. Groneman. Published by Bruce Publishing Co., Milwaukee, 1948. Cloth, 5½ x 8½ in.; 151 pages. Price $2.

The first 14 chapters (52 pages) of this book give a resume of the fundamentals of arc and oxyacetylene welding. These pages also attempt to cover data on the equipment, rods, electrodes, fluxes, metals and safety practices, plus a complete course in arc and gas welding—a job which cannot be done in this space. Remainder of the book is devoted to some 38 projects which may be undertaken in a welding school.

* * *

Welding Education

WELDING FUNDAMENTALS. By H. P. Rigsby. Published by Pitman Publishing Corp., New York, 1948. Cloth, 6 x 9 in.; 178 pages. Price $2.75.

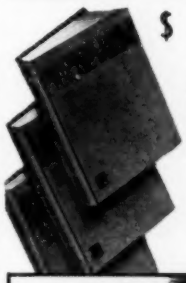
Professor Rigsby points out in the preface to *Welding Fundamentals* that he proposes to present a compilation of the fundamentals and principles of welding that will be useful to the engineering student. As one who is keenly aware of the need for adequately educating engineers in welding, this reviewer thinks that the author failed in his purpose. Nothing new is presented.

The first 130 pages of the volume are divided into 16 chapters discussing all phases of welding and welding training. The chapters vary in length from four to 15 pages, with the two most lengthy chapters dealing with welding symbols and a glossary of welding terms. The next 32 pages consist of a 13-lesson course in arc welding, gas welding and flame cutting. There is an appendix which includes a table of melting points and an iron-carbon diagram. An index and a bibliography listing eight references close the book.

NEW Intensive 6 weeks course trains your men for *faster welding*

Cost saving methods, techniques and design are taught by experienced instructors in this NON PROFIT School.

Classes begin every Monday. Tuition is low. Approved under G. I. Bill. Check coupon for details on **The HOBART School of Welding.**



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How to redesign for ARC WELDING

These books show hundreds of designs to help make your product better, at lower cost. Price $3.50 each, or $10.00 complete set of 3 volumes. Order yours today.

HOBART No. 10—E6010
a faster electrode
for "all-position" welding

Try it. Comparison will prove you can get more top quality welding per day.

Hobart Electrodes are made for every application of A. C. and D. C. welding. Tell us the type work you do and we'll send samples for you to try out.

It pays to have standby A. C. Power for tools, lights—plus A. C. WELDING

This 200 Amp. welder is changed to 5 KW power plant by flipping a switch.

Handle routine jobs easier—be prepared for emergencies.

write to HOBART

Powered by a husky 4-cylinder gas engine. Portable if desired.

Save $300 to $500 "Build-Your-Own" Portable arc welder WITH THIS LOW COST HOBART

Generators without motors are made in all sizes. Choose A.C. or D.C. size you need. Hook to your own power source. Get details today.

HOBART BROTHERS CO., Box U-1091, Troy, Ohio

HOBART

"One of the world's largest builders of arc welders"

HOBART BROTHERS CO., Box U-1091, Troy, Ohio

Please send more information on HOBART items checked below:

- ☐ Hobart Trade School
- ☐ Practical Design for Arc Welding
- ☐ A.C. Welder—A.C. Power Unit
- ☐ Hobart Electrodes
- ☐ Generators to "Build-Your-Own"
- ☐ Hobart D.C. and A.C. Welders

Name_____

Firm_____

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"Don't Gamble!"

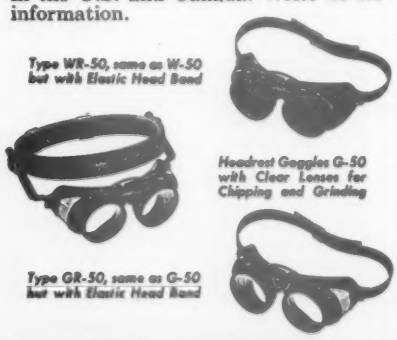
Eye injuries amount to about one-third of industrial accidents. Yet with proper precautions 90% of these can be prevented. All too many seem to be gambling on their good luck—and with disastrous results. Far better to follow the recommendations of safety experts and choose the right protection for each job.

For Gas Welding, Cutting, and Brazing, Jackson Headrest Goggles type W-50 are light and easy to wear, with or without prescription glasses, are simple and easy to adjust, easy to raise and lower.

Goggle assembly is hinged from headrest with telescopic arms, held gently against the face by concealed springs. Spring clips hold arms to headrest to provide added adjustment and easy replacement. Headrest of light, easy to clean plastic, adjustable for size.

Plastic eye cups easily fitted to the face. Outside of each cup has ventilating screen to prevent fogging and baffle plate to keep flying particles and light rays out. 50 mm. glass lenses are available in standard shades from 3 through 6, and have cover glasses to protect them.

Sold only by distributors and dealers in the U.S. and Canada. Write us for information.



Type WR-50, same as W-50 but with Elastic Head Band

Headrest Goggles G-50 with Clear Lenses for Chipping and Grinding

Type GR-50, same as G-50 but with Elastic Head Band

SAFETY GOGGLES • SPECTACLES • EYESHIELDS

JACKSON PRODUCTS

WARREN • MICHIGAN

Letter to the Editor

"It's about time for the welding industry to wise up and appreciate the helping hand of the vocational schools of this country.

During the war, aircraft factories, shipyards, tank factories and all types of construction and manufacturing companies used men and women trained by the vocational schools. Our school, Santa Monica Technical School, turned out 5,000 trained welding operators in 3½ years. Other schools did as well.

Welding has advanced scientifically to a point where specialized training is a necessity. There is much to be learned in the skilled trade of welding which cannot be taught on the job. The apprenticeship method is one of the best methods of training and enriched through related vocational courses, this method is without equal. Yet, in checking the Apprenticeship Council of California we find but 32 welding apprentices in the state.

In my opinion, men who receive vocational training are better than the average. At this school the State Building Code Test was given to 26 students of which 24 passed their plates with much better than average grades. As another example, a Carpentry Apprenticeship Council gave an examination to six journeymen carpenters and eighteen of our apprenticeship students. The students were the only ones to pass the test.

In vocational classes we go further than just training a man in skills he must have to do the job. We endeavor to stimulate the student's natural abilities and develop a friendly and congenial attitude towards his co-workers.

An example in our experience is that of Vince Sully, whose school enrollment card classified him as a machine shop handyman. Today, two years after completion of his course, he is the foreman in the same shop in which he was doing odd jobs. Chester Collins, classified as a gas weldor, enrolled in an arc welding course and today, because of his training, is now a foreman for the Southern Counties Gas Co.

Vocational education is not taking all the credit for these advancements. The credit is largely due to the type of students who enroll in our classes. They have the character and the will to learn and thus to advance. This is the man the welding industry needs.

However, the welding industry is not taking advantage of the valuable aid which vocational schools can give. At comparatively little cost, industry could assure itself of ambitious, well trained men.

As for you personnel men, do you know the vocational school in your community? Does your employment application ask about formal training? Do you show any interest in plans of the applicant to continue training? Do you encourage men in your shop to advance themselves by training in trade extension courses?

Men with an active interest in their trade and who are well schooled make for a smoother and more efficient shop.

Vocational schools are extending a hand. Don't bite that hand!

James O'Neill (signed)
Santa Monica City Schools
Santa Monica, California.

MANGANAL

(T. M. Reg. U.S. Pat. Off.)

11-13½% Manganese-Nickel Steel

HOT ROLLED PLATES meet the Challenge!

For Endurance and Economy in Replacing Worn Parts!

Manganal is the air-conditioned, non-magnetic steel that hardens in use . . . and as a result often outlasts new parts. Work-hardens under impact and abrasion to 550 Brinell. Can be punched and sheared, formed hot or cold. Sizes 3/16" to 1" thickness, 48" or 144". Tensile strength up to 150,000 p.s.i.

PRACTICAL APPLICATIONS

- Quarry and Mine Skips
- Gravel & Crushed Stone Chutes
- Shovel and Dragline Buckets
- Tractor Equipment
- Foundry Shakeout Machines
- Pedestal and Journal Box Liners
- Steel Mill Equipment
- Quarry-Truck Liners
- Muckers
- Crusher Liners
- Crusher Hammers
- Conveyor Flights

Discover New Economy in the Repairing and Replacing of Worn Equipment . . . Write today for copy of "Manganal Marketer" FREE!

Name of Nearest Distributor on Request

STULZ-SICKLES CO

SOLE PRODUCERS

91 N. J. Railroad Ave., Newark 5, N. J.

30 YEARS AGO

(From THE WELDING ENGINEER of October, 1919)

USE of acetylene in Navy yards during the recent war is discussed in an article written by Commander H. G. Knox for this issue. Average consumption at the New York yard, mostly for flame-cutting, was 110,000 cu ft per month; at Charleston, 15,000 cu ft; Norfolk, 60,000 cu ft and at Boston, 75,000 cu ft. The entire bow section of a battleship damaged by a mine explosion was repaired using the cutting and welding torch to full advantage, Commander Knox writes. Salvaging of the main engine cylinders on the captured German ships was also made possible by the welding torch and the electric arc. The Norfolk navy yard produced 15,000 defense mines, each requiring a 10 ft gas weld at its equator.

— 30 YEARS AGO —

GREAT progress in the use of automatic welding and flame-cutting machines has been noted since 1917. A Paris welding magazine, *Revue de la Soudure Autogene*, says that such processes have become necessary because of the increasing demands by labor for higher wages. Since all French industrial progress was slowed by the war, adoption of this process is urged as a means to quicker recovery.

— 30 YEARS AGO —

ADDITION of vanadium to welding rods has been found to produce some advantages such as fine grain, greater elongation and a thoroughly deoxidized weld. Disadvantages, if extreme care is not used, are a discolored weld area and complete burning of the vanadium.

— 30 YEARS AGO —

APPROVAL of the Thermit process by the American Bureau of Shipping for welding stern frames, rudder frames and other heavy sections of ships was recently announced. The only qualification is that the bureau has to be notified sufficiently in advance so that it may have a surveyor watch the welding and inspect it afterwards.

— 30 YEARS AGO —

USE of advertising as a sensible aid to the welding shop is discussed in the first of a new series of articles by the editor of THE WELDING ENGINEER, L. B. Mackenzie. Principal argument is that advertisements in trade magazines frequently contain as much useful, practical information as the reading matter and as such are closely read by the people in the trade.

— 30 YEARS AGO —

SAVINGS of 500 tons weight in rivets and overlapping plates on a 9,500 ton ship with the use of welded construction is reported by the Electric Welding Committee of the Emergency Fleet Corporation. This committee has also established the fact that a saving of at least 25 per cent in construction time can be accomplished by welding.

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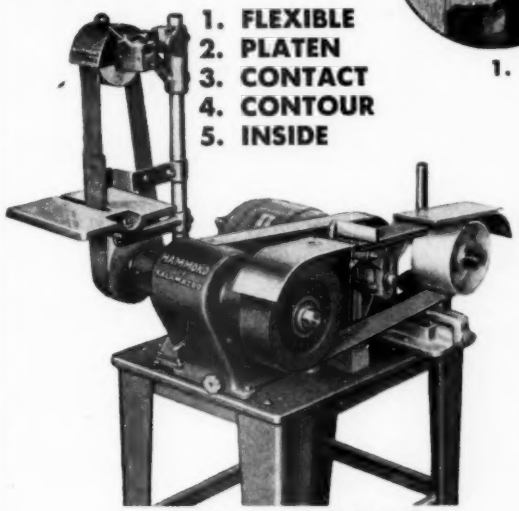

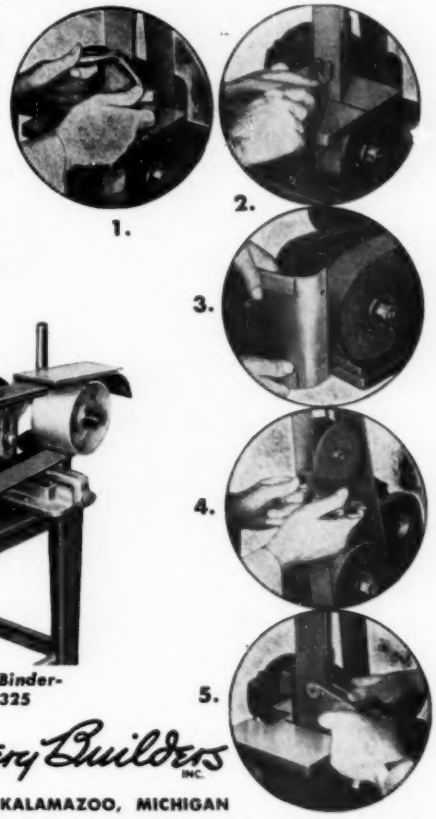

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Write for Abrasive Belt Binder-Polisher Catalog No. 325

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DE-STA-CO *Quality* TOGGLE CLAMPS

Your work-holding tools give fast, uniform clamping action—longer life—greater power—because De-Sta-Co's more than forty models give you *quality* features:

- Well-engineered designs, precision-tooled for uniformity.
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New portable and plunger clamps are coming—to meet your various work-holding needs. Write for illustrated clamp catalog and name of stocking representative in your area.

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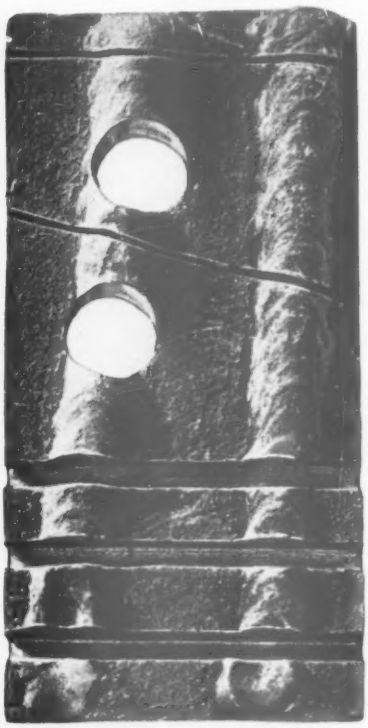

Photo shows machining, drilling, sawing on NICO Welds

MACHINABLE WELDS ON CAST IRON

with **NICO ELECTRODES**

No pre-heating necessary

• For best results operation should be continuous—arc should not be broken until weld is complete or the full length of the electrode is consumed.

Some advantages of the NICO Proven Electrode . . .

• Weld deposit is same color • deposit and entire weld area is machineable—no hard spots • deposit is non-porous on clean castings—fine grained • deposit strength equal to cast iron.

• NICO is a 3-way position electrode • maintains a stable, quiet arc—minimum spatter.

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AMERICAN ARC WELDERS, Inc.
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yours for the asking

Twenty-eight pages of easily found information, complete with factory model numbers, replacement brush numbers, scaled illustrations of brushes listed, and all other necessary data. Here is a regular "Encyclopedia" of Brush information covering all types and makes of welding equipment.

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BECKER BROTHERS CARBON CO.
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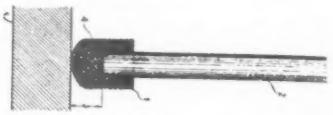
From the Patent Office

Automatic Arc Striker

2,472,923. RAOUL JEAN SCHMERBER, Uccle, Belgium. Assigned to La Soudure Electrique Autogene, Societe Anonyme, Brussels, Belgium. Filed Nov. 18, 1946. Granted June 14, 1949.

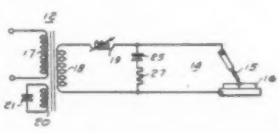


Newly patented method for striking an arc on automatic welders utilizes a metal electrode and a fuse composed of an iron body containing a chromic acid compound. The chromic acid and the iron produce an initial ionization of the space to start an arc between the electrode and workpiece when the current is turned on.

• • •

A-C Welding System

2,473,917. EMIL F. STEINERT, Williamsville, and CHARLES H. JENNINGS, Buffalo, N. Y. Assigned to Westinghouse Electric Corp., East Pittsburgh, Pa. Filed Feb. 13, 1948. Granted June 21, 1949.

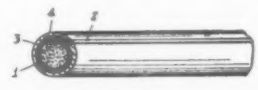


A new a-c welding system consists of a welding transformer, a capacitor connected in shunt circuit relation between transformer and the arc, and a resistor connected in series circuit relation with the capacitor to reduce the arc noise without appreciably reducing the stabilizing effect of the capacitor.

• • •

Automatic Welding Electrode

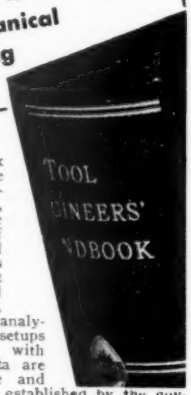
2,465,503. GORHAM W. WOODS, Cleveland, assigned to The Lincoln Electric Co., Cleveland. Filed Oct. 8, 1947. Granted March 29, 1949.



A new patented method for making electrodes consists of forming an elongated metal tube with inner and outer overlapping edges. The outer overlapping edges are turned outwardly to form a continuous integral rib along the length of the tube. An outer coating of flux on the tube leaves this rib exposed to pick up the electric current.

JUST OUT!

An outstanding reference on PLANNING, CONTROL DESIGN, TOOLING and OPERATIONS in the mechanical manufacturing industries



THIS handbook brings you the most modern, authoritative data on the design, fabrication, maintenance and economical use of tools and machinery used in industry. It covers product design and cost estimating, the economical selection of machines, processes, and tools, the analysis and improvement of setups and operations. Use it with complete confidence. Data are based wherever possible and practicable, on standards established by the government, professional associations and leading industrial companies.

TOOL ENGINEERS HANDBOOK

American Society of Tool Engineers

Frank W. Wilson, Editor-in-Chief

Written by 144 authorities in the field, this massive reference, consisting of 115 big sections covering tool engineering from A to Z, has been checked and double checked from cover to cover to insure accuracy. Here are the complete, authoritative answers to your problems, brought to you in compact, easy-to-find form.

More than 2000 pages! Over 1500 illustrations! Hundreds of tables, charts, keyed diagrams, symbols, definitions, equations, etc.

A small selection of highlights selected at random to illustrate the scope of this Handbook:

- Describes types of machines, cutting tools, tool holders, fixtures and operations in precision production boring.
- Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
- Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting-tool materials and cutting practices.
- Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
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- Discusses welding, gluing and mechanical joining of materials.

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Position WE-10-49

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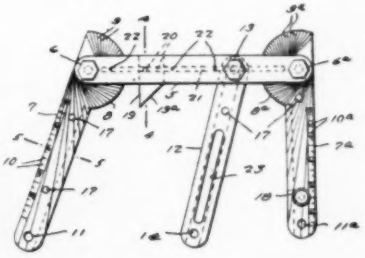
Cutting Torch Guide

2,465,413. RALPH L. YORK, Lebanon, Oregon. Filed Nov. 1, 1944. Granted March 29, 1949.

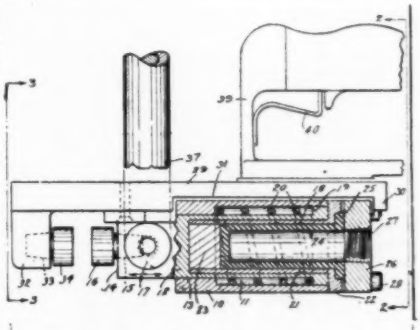


A recently patented cutting-guide device has a pair of stock rest bars with parallel longitudinal edges. Clamping screws connect opposite ends of the bars. Elongated torch guides pivot at corresponding ends on these clamping screws. The torch guide consists of a bar provided at its pivoted end with a projecting segment having degree lines extending tangentially to register with the edges of the stock rest bars. The torch guides are thick and have longitudinal grooves in their edges to minimize disturbance of a torch guided by them.

• • •

Spot Welding Gun

2,467,629. LOUIS R. O'NEILL, Warren, O. Filed Oct. 11, 1948. Granted April 19, 1949.



This patent pertains to a spot welding gun of the type that applies pressure to the parts to be welded. It includes a fixed and a movable electrode with means for applying pressure through the latter. Pressure is obtained through a telescopically engaged piston and cylinder assembly on the movable electrode.

• • •

D-C Inert-Arc Welding

2,473,601. ROSCOE R. LOBOSCO, Elizabeth, N. J. Assigned to The Linde Air Products Co. Filed June 8, 1946. Granted June 21, 1949.

This patented inert-arc welding method includes the use of a thin coating, highly emissive of electrons when heated, along the surface of the metal. The film is applied in order to have a stable arc condition during welding. Polarity of the workpiece is positive.

HERE IS ONE OF AMERICA'S MOST FAVORED

WELDING GOGGLES

This is the famous No. 420 Sellstrom welding goggle. It has found great favor not only with welders in the United States, but its fame has spread to other countries. Without direct solicitation or advertising on our part, we are receiving orders from various countries in Central and South America, and even a few from Africa.

There are various reasons for this popularity.

1. It is exceptionally light weight, being moulded completely of rugged, black "Durez" plastic.
2. Sparks cannot get under the goggle edges. The cups are moulded with carefully rounded edges to insure a snug fit for both eyes.
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4. To assure a perfect fit for practically every type of face, the goggles are provided with a covered ball-chain bridge which has a chain anchor adjustable to 1/1000 inch for any variance in facial contour.
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6. The total weight, including lenses, is less than 3 ounces.
7. Accommodates any 50 mm. lenses such as:

   420 LEV Excelolite Micoquille, graded to density (commercial standard)

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   420 LXX Sel XX Flat, graded to density (commercial standard)

   420 LGH Sel Green 1.25C Hardened, graded to density (meets Federal specifications)

When you buy welding goggles specify SELLSTROM NO. 420

These goggles will render unusual service. They incorporate patented features not obtainable elsewhere. They will please the most critical welders, are economical to buy and are in stock ready for immediate delivery by every dealer selling Sellstrom eye and face safeguards. If your dealer cannot supply you, write us for name of your nearest dealer who can make immediate delivery.

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When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made **downhand**—that's efficient welding!

Weldors spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP24—an illustrated circular detailing the **Specific** advantages of C-F Positioners.

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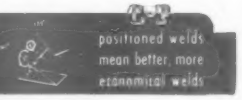

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Low Temperature Fluxes

Gas Saving Fluxes

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YET COST SO LITTLE

"Anti-Borax" Fluxes are GOOD . . . they are GUARANTEED. For best results in welding cast iron, brass, bronze, malleable iron, stainless steel, and aluminum use "ANTI-BORAX" Fluxes.

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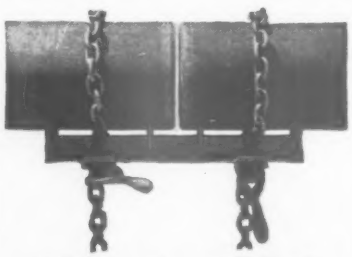

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Faster . . . Easier . . . Truer
WITH
JEWEL PIPE CLAMPS

They align pipe perfectly and hold it secure for tacking. On in a minute—off in ten seconds. Two sizes, ½ to 8 in.—8 to 16 in. Rigid construction resists strain, heat, and abuse.

Other Jewel Clamps for Ells, long and short turn—for Flanges—for Headers. Also Pipe Marker, eliminates patterns for holes and saddles.

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Write Today for Details and Prices

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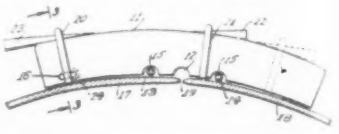
1841 University Ave.
ST. PAUL 4, MINNESOTA

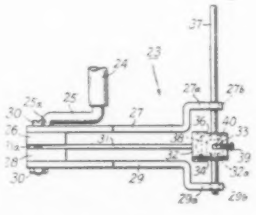
Aligning Clamp

2,469,965. DONALD C. HOLT, Oradell, N. J. Assigned to The M. W. Kellogg Co., New York City. Filed Jan. 29, 1946. Granted May 10, 1949.



A newly patented device is said to securely hold plate members preparatory to welding their adjoining edges. It comprises a strap member adapted to be set on edge across the gap between plates; the strap has a curved narrow side coinciding with the desired curvature in the assembled plate. A slot extends along the length of the strap. U-shaped members straddle the strap member and are welded at their ends to the plate members. Tapered pins are driven between the closed end of the U-shaped members and the outer edge of the strap to conform the curvature of the plate members to the curvature of the strap. The pins also are driven through the slot in the strap and a side of the U-shaped member to adjust the spacing between the adjoining edges. Connection between slot and associated pin is yieldable to permit creepage of the plates as a result of shrinkage from the weld cooling.

* * *



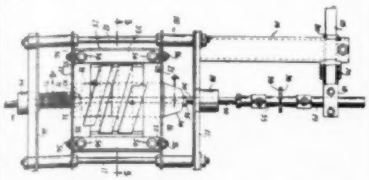
Floating Electrode

2,474,340. SAMUEL W. WARNER, Newark, N. J. Filed Jan. 15, 1948. Granted June 28, 1949.

Patent pertains to welding apparatus in which an electrode is mounted in a fixed support. A second support is mounted on a shaft for movement about its axis. The second support is moved by a power mechanism in an arc toward the fixed support. A resilient arm is attached to and movable with the movable support. An electrode carried by and movable with the resilient arm is brought into axially aligned engagement with the fixed electrode. When the movable support is swung toward the fixed support, the opposed ends of the electrodes clamp between them the pieces to be welded. The resilient arm is flexed thereby to drive the second electrode toward the first electrode when the metal being welded softens, without the necessity of otherwise moving the movable electrode. A guiding device is secured to and carried by the movable support. The movable electrode engages the guiding device so as to be constrained to substantially axial movement.

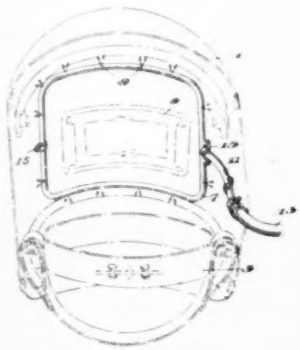
Stored Energy R-W System

2,473,772. ALFRED VANG, New York City. Filed March 2, 1945. Granted June 21, 1949.



This resistance welding system includes two opposed electrodes, a pair of solenoids associated to form a transformer and an armature in one of the solenoids for pushing the electrodes together. The secondary supplies a welding current to the electrode and the primary is connected to an abruptly interceptible source of current. The only iron in the transformer is the armature.

* * *

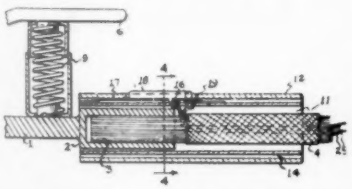


Air Supplied Helmet

2,469,273. CHARLES M. PARKER, Kelford, N. C. Filed Aug. 22, 1944. Granted May 3, 1949.

A new attachment for supplying air to a welding helmet has been patented. The attachment includes a perforated air supply pipe positioned around the sight opening in the face-covering portion of the helmet. The perforations in the air supply pipe are in the outer peripheral surface and discharge air in an outward direction around the sight opening.

* * *

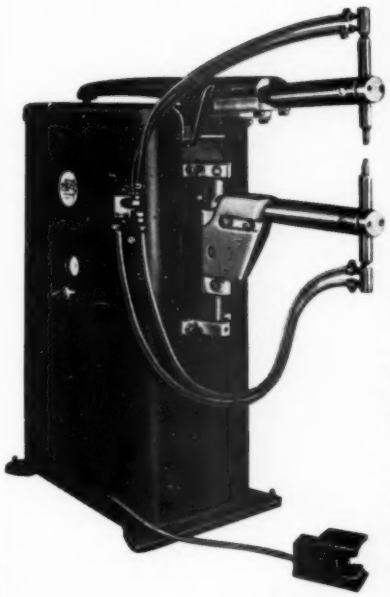


Electrode Holder Switch

2,468,873. SIDNEY M. HARVEY, Detroit, Mich. Filed Sept. 1, 1948. Granted May 3, 1949.

A newly patented switch for a welding electrode holder has a pair of spaced contacts fixed on the inner insulating member. A bridging conductor is between the insulating members and has its end seated on the inner one and its middle part sprung against the outer member, clear of the contacts. A push button attached to the middle portion springs it against the contacts.

FAST .. ACCURATE .. DEPENDABLE



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- HEAVY, RIGID FRAME
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- WATER-COOLED COILS

This new Banner Spot Welder was designed for fast, accurate, production line work . . . for heavy duty, continuous operation.

Equipped with high quality, heavy duty tap switch with 8 ranges of heat selection. Secondary coils water-cooled. Pancake coils employ extra large wire size, for ample reserve capacity. Pivot points equipped with large size, self-lubricating bushings.

Full of features that pay off in longer life and dependable performance. Foot or air operated models. Send for new literature today.

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An oxy-acetylene flame as seen through a Shade No. 4 ordinary goggle lens. Note . . . the amount of glare and lack of detail in comparison with photograph at right.

VISUAL DEMONSTRATION OF THE Superiority of AGILE Metalklad WELDING GOGGLE FILTER LENS

THEY DIFFUSE HARMFUL FLAME GLARE AND HAZE!

42% MORE VISIBILITY
15-50% MORE EFFICIENCY
100% EYE PROTECTION

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An oxy-acetylene flame as seen through a Shade No. 4 METALKLAD GOGGLE LENS. Note . . . the absence of glare and the sharpness of the work.

These filter lens are as different from ordinary lens as day is from night. The clear, sharp vision of the work, obtained through AGILE METALKLAD WELDING GOGGLE FILTER LENSES, decreases eye-strain and eye-fatigue thereby increasing production efficiency. Available in any density and quantity.

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Designed, tested and proved for high pressures and severe service.

Packing washer may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

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Ball-nose seat construction assures positive shut-off.

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Available with diaphragm-type or packed-type construction.

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Equipped with bursting disc safety device.

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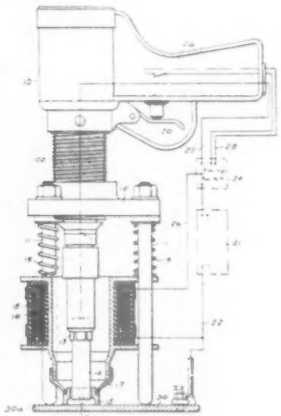
The BASTIAN-BLESSING

4201 W. Peterson Ave., Chicago 30, Illinois

Pioneers and Leaders in the Design and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases

Stud Welder

2,473,871. HARRY EDELS, Stafford, England. Assigned to The English Electric Co., Ltd., London. Filed June 18, 1946. Granted June 21, 1949.

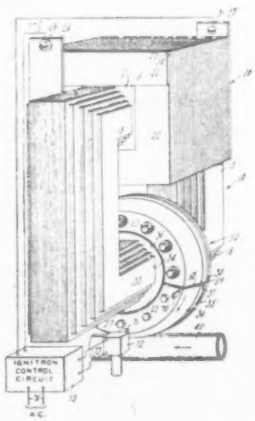


Patent pertains to a stud welder for welding bolts, etc. to ferro-magnetic surfaces near their edges. Supports engage the surface of the workpiece and holders position the stud between the support means to make a symmetrical magnetic field in the surface in immediate proximity to the arc. To help accomplish the latter, an electromagnet is slidably mounted on the supports.

* * *

R-W Apparatus

2,466,761. PAUL CAHEN and GUSTAVO ADOLPHO MARINHO LUTZ, Rio de Janeiro, Brazil. Filed May 26, 1944. Granted April 12, 1949.



In resistance welding apparatus a pair of circumferentially split annular welding electrodes are rotatably mounted on the transformer core in spaced relation to each other. The splits in the electrodes are aligned and a split annular conductor is mounted between and mechanically secured to each electrode. Diametrically oppositely spaced means respectively electrically connect one electrode to the conductor to provide at least one complete secondary winding.

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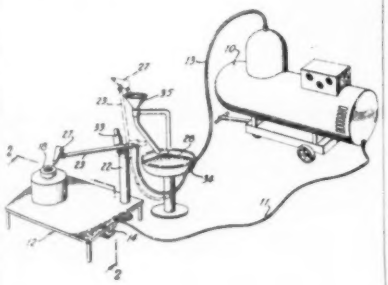
EMPIRE STATE BUILDING

NEW YORK 1, N. Y.

Semi-Automatic Arc Welding

2,474,075. Hyrum M. Talley, Alhambra, Calif. Filed May 7, 1948. Granted June 21, 1949.

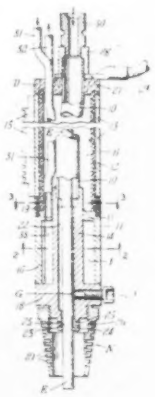


Patent pertains to welding apparatus including a support and means for rotating the support about a vertical aixs. A resilient arm pivotally mounted next to the support is for swing movement downwards and toward the axis of rotation of the work. The arm rests against a stop when in operating position. The resiliency of the arm permits it to be sprung toward the work to a position beyond that permitted by the stop when the arm is drawing an electric arc. A hopper carried by the arm is adapted to discharge flux along the welding seam. The welding electrode goes through the hopper and the flux.

* * *

Inert-Arc Torch

2,468,806. Frank J. Pilia, Riverside, N. J. Assigned to The Linde Air Products Co. Filed May 10, 1946. Granted May 3, 1949.



Patent pertains to a water-cooled electrode holder for inert-gas-shielded arc welding. The torch comprises an electrically conductive electrode support sleeve, electrode contacting means mounted on the sleeve and means for supplying current through the sleeve to the electrode. A nozzle is mounted on the sleeve which has an internal surface concentric with the electrode to form an annular gas passage terminating in an annular orifice. The electrode sleeve has a passage extending adjacent the electrode for supplying gas to the annular passage.

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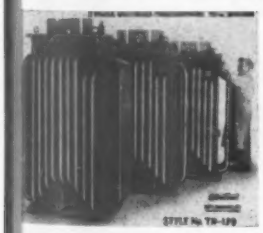

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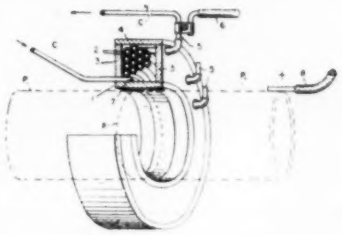
Magnetic Control of Arc

2,472,851. GEORGE G. LANDIS, South Euclid, O., and NORMAN J. HOENIE, Cleveland Heights, O. Assigned to The Lincoln Electric Co., Cleveland. Filed Sept. 23, 1944. Granted June 14, 1949.

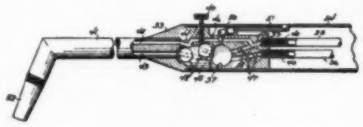


Patent pertains to the combination of an annular electrode transversely split to permit relative movement of its parts and adapted to be supported with one face in spaced relation to the workpiece. An electrical conductor is connected to the electrode and is formed into a number of insulated turns concentric with the electrode. A second conductor is connected to the workpiece to form a complete circuit. The magnetic field induced by the flow of current through the turns of the first conductor causes the arc to travel in a circular path defined by the electrode face.

* * *

Combination Torch

2,463,399. METCALF B. LOWE, Long Beach, Calif. Filed Sept. 5, 1944. Issued March 1, 1949.



Patent pertains to a torch having a pair of supply passages to a mixing chamber and a pair of outlet passages. Valves on opposite sides of the body section intersect the passages. A nozzle in the body section has passages communicating with the outlet passages from the mixing chamber. A tip on the nozzle has a central passage connected to one of the outlet passages. A number of passages around the central passage communicate with the other outlet. Check valves are positioned in the supply passages leading to the mixing chamber. A by-pass channel in the body section provides communication between one of the supply tubes and one of the outlets.

* * *

R-W Electrode Dresser

2,467,091. LOUIS R. O'NEILL, Warren, O. Assigned to Federal Machine and Welder Co., Warren, O. Filed May 4, 1946. Granted April 12, 1949.

Patent pertains to a dressing device for use with a seam welding machine. The dresser is engageable with the periphery of the electrode. A spacing mechanism on the dressing device holds the tool at the proper distance from the electrode surface.

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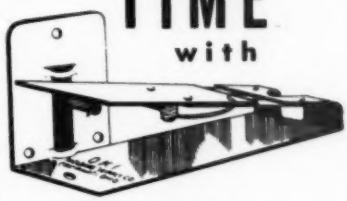

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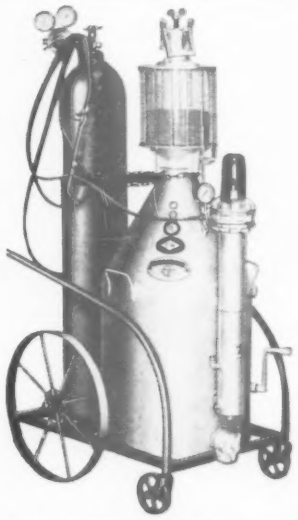

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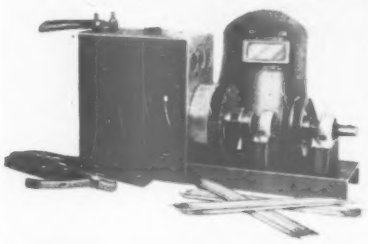

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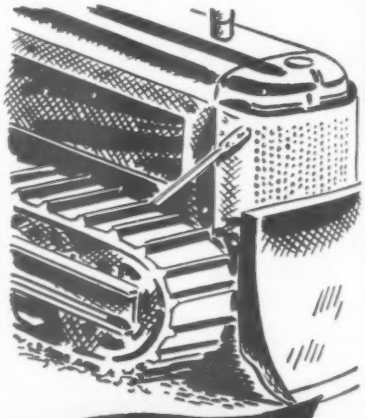

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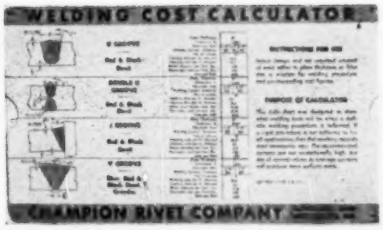

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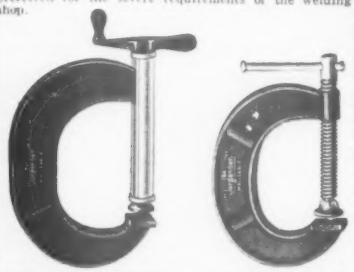

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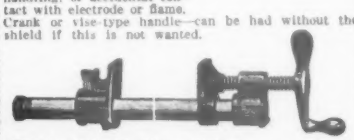

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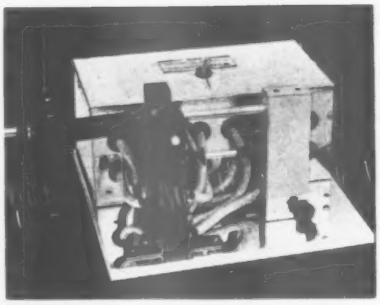

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